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A Gross Motor Rhythm Test

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IN THE PAST, testing in the area of rhythm has been, for the most part, limited to small specific reactions to a tapped beat (5), reiteration of a specific rhythmic pattern that was either seen or heard (1, 2 and 3), and a sampling of the learning curve as evidenced in reactions similar to the above (4). The necessity of developing a gross motor rhythm test that would cut across the skills of folk, square, and modern dance was precipitated in the fall of 1945 at the State University of Iowa by the adoption of the skills program based upon achievement standards. This presentation reports the procedures used since 1945 and the findings of the study made from September 1946 through March 1952.[1]

Background of the Study

This type of test required administrative limitations to the following degree:

1. A test in which individual reactions could be judged.
2. A test which could be administered within a reasonable length of time to an entire class.
3. A test which would require a minimum of staff training and staff personnel for its administration.
4. A test in which standardized administration of the items would be feasible.

In this situation, the course content was similar to that used, in general, in most dance classes. In modern dance, a vocabulary of movement was developed by use of techniques, rhythmic experiences, and simple improvisation. In folk and square dance, the simple techniques necessary to execution of traditional dances were taught as well as the dances themselves. Rhythmic experiences were provided, in the folk and square dance classes, so that the student understood duple and triple rhythm as found in these dance forms.

The problem was then identified as a need to find elements of movement that appear in the instructional units of folk, square, and modern dance. Total body movement initiated by the student was another standard to be met. The test items selected by the committee are movement samplings possible under these standards and the administrative limitations as stated. These movement samplings were defined as elements of gross motor rhythm in that the whole body was in action under conditions similar to the teaching situation.

Prior to the fall of 1945, a test had been constructed using the following items:

[1] Study completed at State University of Iowa, Iowa City, Iowa.

Section I—Directed walk, run, and skip.
Section II—Musical excerpts for improvisation.
Section III—Derived or combined dance steps. Step identified but student initiating the movement for polka, waltz, and schottische.

Experience in the use of this test during 1945-46 pointed out the need for standardized directions; that the voice of a woman on the recording was difficult to understand; that some musical excerpts were too short, too long, and/or too much alike in rhythm or melody; that irregularities in the spacing of the musical excerpts made difficulties in judging; and that the rating scale in use was vague and subject to individual interpretation.

Procedure

Study and revision of the test during the summer of 1946 proceeded as follows:

1. A rating scale was submitted to a research class for analysis and suggestions and reworked by a committee of experienced dance instructors. This scale was based upon a zero to four score with the following items described under each rating: response to beat, correct rhythm pattern, ability to maintain and vary movement, ability to change direction, style of movement (from forced and mechanical to alive and spirited). See Appendix I, page 259.

2. Musical excerpts were selected for two complete forms of the test from a wide variety of suggested possibilities. See Appendix II, page 260.

3. Using a committee of experienced dance instructors, the items in the original test were reviewed and it was decided to retain these, with the addition of one excerpt of moderately fast waltz music in Section III. It was hoped to raise discrimination by this addition. Folk and square dance use derived dance steps as basic material while modern uses them as points of departure. Since extremely limited reactions were accepted for Section II, it was the consensus of opinion that no advantage would accrue to any specific form of dance. See Instruction Sheet, Appendix III, page 260. It was the opinion of this committee of experienced dance instructors that the items selected were commonly covered in these forms of dance and would test gross motor rhythm as defined in this study. In other words, face validity was used.

4. A study was made of the timing on professional recordings and of the timing necessary for judging three students simultaneously. Seven-second intervals between selections of music were decided upon, with the excerpts varying in length dependent upon the movement under consideration.

5. Both forms of the test were used (in mixed application) with an experimental group (*N-14*). Scattergrams of the judges' reactions were made to check relationships between individual ratings. These revealed:
(a) That individual scorers found those persons who were outstandingly poor in rhythm.

(b) That the range on total scores seemed wide enough to point to possibilities for discrimination between performers.
(c) That certain widely scattered scorings on the same individual indicated a need for training periods and practice periods for judges.

6. Because of the nature of the material, it was impossible to repeat the test to establish reliability. With the pilot group (*N-14*), mixed applications of Forms 1 and 2 were run on consecutive days under identical circumstances. A short questionnaire given to these students revealed that they were aware that the test items were the same but uncertain that the music had changed. The reliability coefficient with this group was .86. Therefore, it was decided that with this evidence from the pilot study and the experience of dance teachers that students react to music in a certain fashion under the same conditions, the test was assumed reliable because of its length (39 scores for each individual).

A second problem concerned the consistency of judges' ratings. Previous experience with ratings of a similar sort in other activities led the committee to accept the test as a satisfactory measure of ability.

7. A standardized instruction sheet was constructed for student use before entering the test. See Appendix III, page 260.

8. Recordings of both forms were cut using a stop-watch and metronome for correct timing. A professional radio announcer recorded the directions on the testing discs.

The test was administered as follows:

1. Students were tested in groups of three using three judges. The sum of the total scores of all judges was used as the student's score. Experimentation revealed that the judges could watch, judge, and record for three persons but that their difficulties increased as the number of persons being judged at a time increased.

2. The test as recorded takes eight minutes. Two groups of three students each were scheduled every 15 minutes. Therefore, 24 students could be judged in one hour. If a continuous schedule for the tests can be arranged, 36-40 students can be judged within a period of an hour and a half.

3. Students were given a uniform statement to read before entering the test. One staff member administered all class sections and gave the same limited directions to the students. These consisted of identifying students by number on "pinnies" and stating that some of the instructions the students had read were repeated on the recording.

4. All judges were trained and given a chance for practice sessions. No instructor judged the class she had taught. The personnel of the board of three judges varied slightly with every class and on every administration of the test. A total of 23 different judges were used. One judge was used as a constant, eight judges served five or more times, while six judges served once only.

5. Alternate forms were used for the administration of the test.

6. Final score records were the responsibility of the individual in charge of rhythm testing.

7. The passing score, for purposes of the skills program, was determined by inspection of the range and selection of a natural break each time the tests were administered. Because this particular skills achievement program necessitated a screening process, no set score was used as the passing grade. If a natural break in the range did not occur, scores close to the passing level in previous testing periods were used as a basis for consideration of each individual's score in relation to her understanding of gross motor rhythm as revealed in her written test score.

This article reports the findings on the use of this gross motor rhythm test from September 1946 through March 1952. Thirteen items comprise the test, judged on a zero to four scale by three judges. The range in scores possible is 0-156. A breakdown of the cases used is presented in Table 1.

TABLE 1

Cases Used in Gross Motor Rhythm Test

Type of dance	Test form #1	Test form #2	Total
Folk dance	190	79	269
Square dance	82	178	260
Modern dance	393	312	705
All forms			1,234

Comparisons of the range, high and low passing scores, percentage of students passing, and the median, mean, and standard deviation for the three forms of dance have been computed. The range, median, mean, and standard deviation for the three sections of the test have also been reported to indicate the parallel between the total score results and the sectional results. In order to determine the difference, if any, between the two testing forms in use, a critical ratio was computed.[2] The same procedure was used for a comparison of the results of the three forms of dance.

Analysis of Data

Table 2 indicates the wide range of scores made in all forms of dance in response to this test. The variations in cutting point or point of differentiation between pass and fail, as marked by a break in the range, show a spread of not more than three points' difference in any form of dance at either end of the passing range which occurred (20 points). The percentage of students

[2]Formula used:

$$\frac{M_1 - M_2}{\sqrt{\left(\frac{\sigma_1}{\sqrt{N_1 - 1}}\right)^2 + \left(\frac{\sigma_2}{\sqrt{N_2 - 1}}\right)^2}}$$

TABLE 2

Selected Scores Based Upon Individual Class Performances

Range of scores	Folk dance	Square dance	Modern dance
Cutting point			
Lowest passing score	59	59	52
Highest passing score	69	69	72
Percentage passing			
Low	68%	69%	74%
High	97%	100%	97%
Number	269	260	705
Range	124-30	115-44	123-23
Median	77.5	71.7	79.5
Mean	74.9	79.7	79.5
Standard deviation	14.0	12.0	15.5

TABLE 3

Sectional Scores

Dance	Form 1			Form 2		
	Sec. 1	Sec. 2	Sec. 3	Sec. 1	Sec. 2	Sec. 3
Folk dance						
N-190				N-79		
Range	28-10	59-20	43-8	23-11	53-24	41.8
Median	18.7	33.8	22.6	15.8	33.9	22.0
Mean	18.6	34.5	22.8	15.9	34.9	22.4
Standard deviation	3.2	6.6	6.1	1.7	5.2	6.4
Square dance						
N-82				N-178		
Range	23-8	50-26	38-12	26-10	55-23	44-11
Median	17.0	36.4	23.0	17.0	36.1	23.6
Mean	18.0	36.8	23.5	17.0	36.2	23.8
Standard deviation	2.6	4.5	5.1	2.8	3.6	3.9
Modern dance						
N-393				N-312		
Range	28-8	58-10	41-2	29-10	55-13	42-4
Median	19.6	37.4	22.5	19.1	37.0	23.3
Mean	19.8	37.2	22.5	19.0	37.0	23.4
Standard deviation	3.2	7.8	7.5	2.6	7.2	6.5

TABLE 4

Comparison of Scores Obtained Using Test Form 1 and Test Form 2

Test form	N.	M.	S.D.	Form 1 / Form 2 Critical Ratio
Folk dance				
Form 1	190	75.0	14.5	
Form 2	79	73.0	10.5	1.3
Square dance				
Form 1	82	77.7	9.6	
Form 2	178	77.0	12.0	.1
Modern dance				
Form 1	393	79.5	16.5	
Form 2	312	79.0	13.5	.1

in individual classes passing the test shows a spread from a low of 68 to a high of 100 (one class each).

Inspection of Table 3 shows the close relationship between the judges' ratings, section by section, using either Form 1 or Form 2 and maintained in the forms of dance used in this study.

In Table 4, critical ratios computed to compare the results of Form 1 with Form 2 show a maximum of 1.3. Critical ratios computed to compare total group scores in folk, square, and modern dance (Table 5) show a maximum value of .4. These ratios indicate no statistically significant difference between Form 1 and Form 2 or between the results of the test for students studying folk, square, or modern dance.

TABLE 5

Comparison of Total Group Scores
(N = 1,234)

Group	N.	M.	S.D.	Folk dance	Square dance	Modern dance
				Critical Ratios		
Folk dance	269	74.9	14.0		.4	.4
Square dance	260	79.7	12.0			.2
Modern dance	705	79.5	15.5			

Conclusions

Apparently, under the conditions existing in this study over a period of five and one-half years and using 1,234 Freshman and Sophomore college girls, a gross motor rhythm test using simple movement initiated by the student has proven equally usable with different students studying the three forms of dance.

The sum of the judges' scores has proven to be a fair and equitable means of evaluating results. This is indicated by the length of the ranges obtained, for both total and sectional scores, and the short spread of passing scores and of percentages passing.

The administration of the test has proven feasible and economical of time in this situation where varied forms of dance had to be judged without excessive staff training and with the use of only one period of class time.

Recommendations

The experimental development and use of dance tests devised to cover similar needs is recommended. Experimentation is suggested in the use of varied forms of accompaniment, varied rhythmic forms, and recordings directed toward specific areas of dance. Testing in dance is a comparatively new area. The advisability of studying test results based upon students from widely differing backgrounds and the use of judges whose preparation differs is obvious.

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APPENDIX I

Rhythm Rating Scale

To be used for entire test:

0—No response or incorrect response.
Correct beat and accent only through chance.
Step and rhythm incorrect.
Attempts to start self in motion; undecided as to correct step. Starts a preliminary faltering movement; then stops.

1—Correct step but not correct beat (unable to pick up new beat or tempo). Correct movement only by imitation of another student.
Awkward, unco-ordinated movement.
Ability to start self in movement—maintained only for a measure or two.
Difficulty in changing direction.

2—Step and rhythm pattern correct. Reaction time slow. Movement uncertain—lapses occasionally into incorrect beat.
Movements are consistently heavy; she shows tension.
Maintenance of movement is short; phrase.
Movment is forced; mechanical. Lacking in style.
It is prosaic—no variety.

3—Uses correct step, beat, and accent. If student loses the accent and gets off the beat, she is aware of it and able to get back on the beat.
Ability to maintain movement throughout excerpt.
Varies direction with effort but is able to maintain movement.
Student shows ability in simple movement. Movement has direction but is not alive and spirited.

4—Immediate response with correct step, beat, and accent.
Ability to maintain movement throughout excerpt.
Ability to vary movement (turns, etc.)
Confidence shown in her movement. Movements are definite, spirited, and easily accomplished. She is relaxed.

APPENDIX II

Musical Excerpts

Form #1

Section 1	*Meas.*	*MM.*	*Time (Sec.)*
Walk—Wisconsin Blueprint	12	112	21.9
Skip—Davies	16	192	19.7
Run—Huerter—*Fire Dance*	24	192	29.3
Section 2			
Skip—*Kerry Dance*	20	208	21.6
Run—Concone—*Study*	16	208	24.8
Fast Walk—Prokofieff	32	132	29.0
Slow Walk—Beethoven—Waterman ABC—p. 108	16	104	33.1
Skip—*New Mown Hay*	24	192	37.2
Run—Reinhold—*Gnomes*	32	208	27.6
Section 3			
Schottische—*Jubilee*	16	192	24.7
Slow Waltz—Tschaikowsky—*Waltz from Sleeping Beauty*	32	138	36.1
Mod. Waltz—Schubert, No. 7	32	168	29.0
Polka—Lichner	32	208	24.3

Form #2

Section 1	*Meas.*	*MM.*	*Time (Sec.)*
Walk—Davies	12	128	20.3
Skip—*Queen of Sheba*	16	208	32.5
Run—Wisconsin Blueprint	12	184	14.4
Section 2			
Skip—Schumann—*Sicilianish*	24	132	21.8
Run—Moszkowski—*Scherzino*	12	208	22.3
Fast Walk—Handel—*Joshua*	16	196	21.0
Slow Walk—*Hollaender March*	17	116	31.6
Skip—*Marche Lorraine*	32	132	28.8
Run—Delibes—*Passapied*	24	208	25.5
Section 3			
Schottische—*Faust-Up-To-Date*	24	168	35.1
Slow Waltz—Gurlitt—*First Dance*	32	138	35.7
Mod. Waltz—Tschaikowsky—*Waltz of the Flowers*	32	168	27.2
Polka—*Plantation Dance*	24	208	25.3

APPENDIX III

Instruction Sheet

Rhythms Practical

In a few moments, you will hear a recording. The first part of this recording has music for walking, running and skipping. Each will be played twice. The first time, listen; the second time after the signal, start. *Keep moving* until the music stops.

The second part of the record consists of musical excerpts. During the musical excerpts you may show us any movement that you think fits the music. If you wish to restrict your movement to walking, running and skipping, you may do so. Any movement that you give us will be accepted and judged for its value. Please show us your best movement.

The third part of the recording has music for the schottiche, waltz, and polka. For some movements, more than one piece of music will be played. The voice will tell you what to do.

(Submitted 7-10-52)

Health and Physical Education Program for Tennessee High School Boys

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THE PROBLEM HEREIN presented is an evaluation of the boys health and physical education programs in Tennessee secondary schools as they existed during the school year 1951-52.

Health and physical education programs involve not only those activities that take place in the classroom, the gymnasium, and on the play field but the capability of the instructors, the organization of the activities, the various facilities with which the teachers have to work, and other factors. In order to make an evaluation, all of these factors must be considered, observed carefully, weighted according to their relative contributions to the program, and, in some way, totaled so that a figure or a statement may be arrived at which will be indicative of the worth or value of each phase, the total program, and the combined status of all the schools.

Background of the Study

This study is limited to the high school health and physical education programs as specified by the LaPorte *Health and Physical Education Score Card No. II* (4). It is further limited to a random proportional stratified sample of the public, white, secondary schools of Tennessee. Only the boys health and physical education programs in these schools were studied.

THE SCORE CARD

The *Health and Physical Education Score Card No. II* (4) is described specifically as a device for evaluating the boys or girls physical education program on the secondary level. It is divided into ten areas, each of which is of importance in a good health and physical education program:

I. Program of Activities
II. Outdoor Areas
III. Indoor Areas
IV. Locker and Shower Areas
V. Swimming Pool
VI. Supplies and Equipment
VII. Medical Examinations and Health Service
VIII. Modified—Individual (corrective) Activities
IX. Organization and Administration of Class Programs
X. Administration of Intramural and Interschool Athletics (4, *p. 5*).

The areas are divided into ten items, each of which may be scored from zero to three points depending on the status of the program in regard to the particular information asked for. As an example, Area I, Item 2, reads:

Program calls for systematic class instruction in activity fundamentals on the "block" or "unit of work" basis (continuous daily instruction in an activity for from three to six weeks). Definite, but unsystematic instruction = 1; systematic instruction in other than block program = 2; systematic block instruction = 3.
Score ..... (4, *p. 5*).

Because of the point system employed, the score card lends itself to numerical comparisons.

SAMPLING TECHNIQUE

It was decided to randomly select 100 schools from the 355 public, white high schools in Tennessee. One hundred is a convenient number with which to work, it is an adequate sample, and it is the same number used in similar studies in other states. Garrett states "The criterion of randomness in a sample is met when every person in the population from which the sample has been drawn has had an equal chance of being chosen." (3) It will be subsequently indicated that every school had such an opportunity to be chosen.

There was a desire to study the quality of program found in different size towns, in the different size schools, in the different state areas, and in the Southern Association accredited and non-accredited schools. There had to be some assurance that there would be sufficient numbers of schools selected for study in the various town-size and school-size categories. Further, there was belief that chance selection would provide enough representation from state areas and accredited and non-accredited schools. Accordingly, it was decided to stratify the schools by town size and by school size only, form the strata into cells, and select a proportionate number of schools from each cell. The prportional stratified technique used is suggested by Parten (6).

Procedure

Utilizing the basic categorizations suggested by the *Research Bulletin* of the National Education Association (7) and adjusting by combining to fit distributions found in Tennessee, the schools were classified in terms of town size and by school size. The sizes of the towns in which the schools were located were secured from the 1952 Census Report (8) and from the *Rand McNally Commercial Atlas and Marketing Guide* (7). The number, names, and enrollments of schools were secured from the *Graded List of Approved High Schools* (9) provided by the Tennessee Department of Education. The stratification of all schools formed the group of cells shown in Table 1.

A small one-inch by two-inch card was assigned each of the schools on which was placed an identifying number, the number of students enrolled, and size of town or community in which the school is located. The cards were distributed into the appropriate cells and, after being shuffled, were assigned numbers ranging from one to the total number of schools in a particular cell. The assigned number was placed on the back of the card. For example, the assigned numbers in Cell 2 ranged from one to 50.

TABLE 1

Total Number of Schools in Tennessee and Number Chosen by Town Size and School Size, 1951

School size	0-499	500-1,499	1,500-9,999	10,000 and up
0 to 199	*Cell 1* 84 schools 28.2% = 24	*Cell 2* 50 schools 28.2% = 14	*Cell 3* 28 schools 28.2% = 8	*Cell 4* No schools 28.2% = 0
200 to 499	*Cell 5* 17 schools 28.2% = 5	*Cell 6* 50 schools 28.2% = 14	*Cell 7* 70 schools 28.2% = 20	*Cell 8* 11 schools 28.2 % = 3
500 up	*Cell 9* 1 school 28.2% = 1	*Cell 10* 2 schools 28.2% = 1	*Cell 11* 12 schools 28.2% = 3	*Cell 12* 30 schools 28.2% = 8

One hundred schools comprise 28.2 per cent of the total of 355 public secondary schools in Tennessee. The number of schools representing 28.2 per cent of the schools in a cell was calculated and that number specified to be chosen at random from the cell. For example, in Cell 1, 28.2 per cent of 84 was found to be 23.7, so, rounding to a whole number, 24 schools was the number designated to be chosen at random from the cell.

The table of random numbers in Lindquist's *Statistical Analysis in Educational Research* (5) was utilized and the schools to be surveyed were determined cell by cell. How schools were determined in Cell 8 should illustrate adequately the procedure used. There were 11 schools (represented by cards) numbered one to 11 in this cell. Twenty-eight per cent of 11 is 3.1 or three schools. A place was selected at random on the table of random numbers. A reader started down the column (direction could have been right, left, or up). When he came to one of the numbers between one and 11, this number was recorded. This first number happened to be two. This random sampling process was continued until two other numbers, seven and three, were found. The school identification numbers on cards two, seven, and three were referred to the total list of the 355 schools and it was found that the high schools selected were: one in East Tennessee, accredited by the Southern Association of Colleges and Secondary Schools; one in Middle Tennessee, also accredited; and the other in West Tennessee, not accredited.

The number of schools chosen from the cells in each of the school-size and town-size categories were controlled by selecting randomly a proportionate number of schools. There were other categories to be studied but by which no stratification was made for sampling purposes. Southern Association accredited and non-accredited schools were to be studied as were state areas as arbitrarily set up by the Tennessee Education Association (1).

APPLICATION OF THE SCORE CARD

A pilot study conducted in eight Indiana high schools revealed that the length of time required to apply the score card was approximately one hour. Using this as one of the bases for organizing the visitations, a plan was

formulated whereby four schools would be visited each day the investigation was conducted. Proximity of the schools was the chief factor utilized in determining the four schools to be visited any particular day. The writer was the only person to score the Tennessee schools. Utilization of other trained personnel to apply the score card might have made the obtained data more meaningful in the eyes of the more critical researcher.

The first school in the day's schedule was visited at 8:00 A.M. The other schools were close enough together that the time consumed traveling between schools was held to a minimum. The last school was usually visited about 2:00 P.M. In some instances, a fifth school was visited after school hours. If the physical education teacher was still around the school, an interview was usually conducted.

At each school, the physical education teacher was approached directly and, in every instance, was quite willing to be interviewed after the explanation was made regarding nature and purpose of the study.

All the items on the score card, the answers to which could be determined only by interview, were discussed with the teacher and the scores recorded, depending on the response. The indoor and outdoor facilities were then visited and observations made pertinent to score card items. After the visit was terminated, the scores appropriate to the facilities were recorded.

Analysis of the Data

The schools were studied in terms of total score card score, area, and item score. Total and area scores were further studied in terms of geographic area (West, Middle and East Tennessee), town size, school size, and accreditation.

After the score card was applied in Tennessee High Schools, the data obtained were analyzed and certain conclusions drawn.

Discussion

The following discussion is based on an analysis of the data obtained as a result of the survey of Tennessee high schools made by the writer (2). Space limits the detailed discussion of all significant findings in the study. The reader is referred to the appropriate chapter in the dissertation for a more complete discussion of the findings (2).

TOTAL SCORE ANALYSIS

The total scores made on score cards ranged from 18 to 168 points. The mean score was 57.6 and the median 52. Three hundred points were possible and the schools averaged only 57.6—19.2 per cent of possible. Therein exists sufficient reason to assume that the quality of the health and physical education programs in Tennessee secondary schools is rather low. The extreme score of 168 was another factor which caused the mean to be higher than the median. A score equal to 50 per cent of possible would be 150 points. It is of interest to note that only one school scored higher than 150.

TABLE 2

Statistical Characteristics of Scores Achieved by 101 Tennessee Schools on the Laporte Score Card, 1951

Title	Numerical value
Range	18-168
Mean	57.6
Median	52.0
Per cent of mean score to possible score	19.2
Standard deviation	26.9
Standard error of the mean	2.7

The distribution and range of score is indicated in the cumulative frequency curve depicted in Figure I.

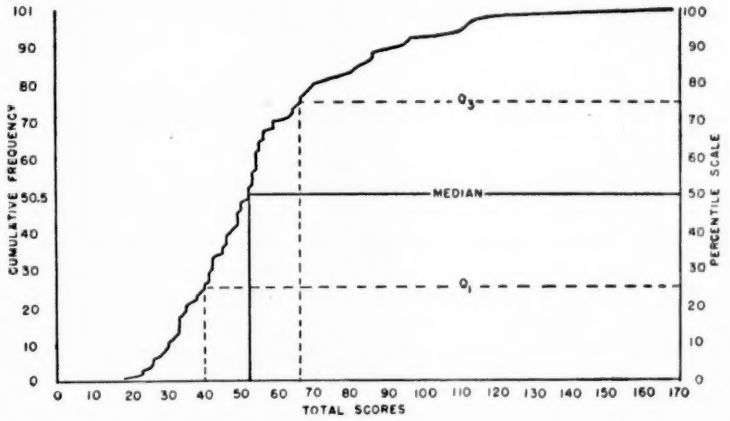

FIG. I. Cumulative Frequency Curve of LaPorte Score Card Total Scores from Selected Tennessee Secondary Schools.

There are no statistically significant differences between the health and physical education programs in the three state areas. There were significant differences in the quality of the health and physical education programs between schools when categorized by town size, with the exception of the two smallest town sizes. The larger the town in which the school is located the better the health and physical education program.

On the average, health and physical education programs are better in large schools than in the smaller ones. Better health and physical education programs are found in Southern Association accredited schools than in the non-accredited ones. It is found when studying the relative effects of such factors as state area, school size, town size, and accreditation by the casual analysis technique indicated in Figure II that the school size is most influential toward a better program, with town size next. Apparently, state area has least effect on whether a health and physical education program is good.

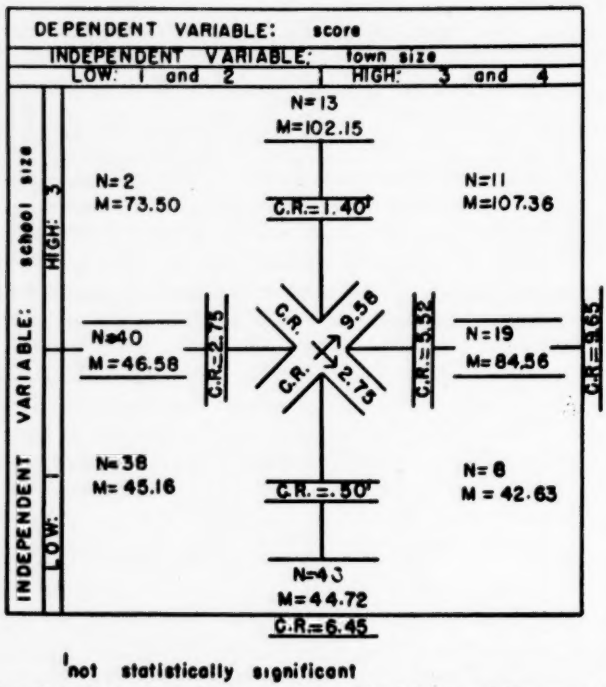

FIG. II. Causal Analysis Chart Indicating Mean Total Scores of Tennessee Schools on LaPorte Score Card by School Size and Town Size with Critical Ratios of Differences Between Means.

AREA SCORE ANALYSIS

The mean scores made on the ten score card areas ranged from zero on Areas V and VIII to 10.4 for Area IX, Administration and Organization of Class Programs. This is rather low, in view of the fact it was possible to score 30 points. Area X, Administration of Intramural and Interschool Athletics, is second high with a mean of 9.3 and Area IV, Locker and Shower Areas, is third with 8.1. Arranged in order downward are Score Card Areas III, Indoor Areas, 7.8; I, Program of Activities, 6.9; VI, Supplies and Equipment, 5.2; II, Outdoor Areas, 5.1; and VII, Medical Examination and Health Service, 4.5.

There was little difference between the mean area scores made by the schools in the three state areas. Fairly consistently, however, West Tennessee scored the highest and Middle Tennessee scored the lowest. When considered by town size, as a general rule, the larger the town the higher the area score. When studied in terms of school size, as illustrated by Figure III, the areas generally fell into the same pattern set by total scores, in that the larger schools had the best mean scores and the smaller ones the lowest. Accredited schools had better area scores than did the non-accredited schools.

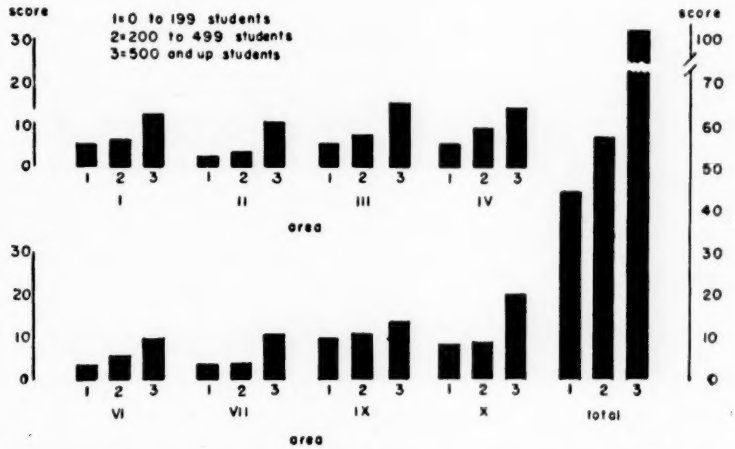

FIG. III. Mean Scores of Score Card Areas and Total Scores by School Size.

The coefficient of correlation of .913 between Area III, Indoor Areas, and total score was found to be the highest and Area I, Program of Activities correlated next highest. Area VII, Medical examination and Health Service was least related to total score. Area III, Indoor Areas, and Area IV, Locker and Shower Areas, were more highly related to total score and to each other. When studied by the causal analysis technique to determine which had the greatest effect on the total score, it was found that the schools that scored high on Area III contributed more to the total program than the other areas studied in this manner which included, in addition to III, Areas I, II, IV, VI, and X.

ITEM ANALYSIS

Each of the ten score card areas is divided into ten items, making a total of 100. Each item may be scored 0, 1, 2 or 3 points. Item mean scores were determined and set up in rank order. To even summarize this phase of the item study would require more space than that available for this paper. The reader is again referred to the original dissertation for the particular information (2).

The Votaw Curve technique (11) was used to study the items as to whether they discriminate the better health and physical education programs from the poor ones. Figure IV indicates that there were 52 discriminative items found by using the Votaw Curve technique. Item 7, in Area VI, and Item 3, in Area VI, were most discriminative while Item 6, in Area IX, was found to be least discriminative. More items pertaining to facilities were found to be discriminative than items pertaining to other phases of the program.

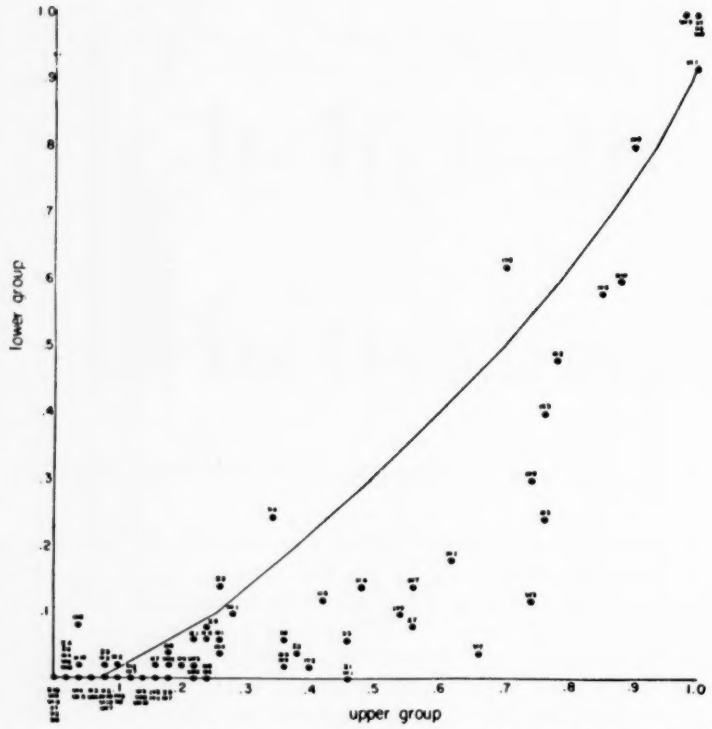

FIG. IV. Votaw Curve and Position of LaPorte Score Card Items Relative to it as Result of Tennessee Study.

Summary

As measured by the LaPorte score card, the quality of the health and physical education program in Tennessee is rather low. As a rule, the schools in the large towns had better programs than those in small towns. The same was found to be true of large and small schools. Southern Association accredited schools had better programs than unaccredited schools. There were no significant differences between the mean scores of the schools in the three geographic areas.

Of the score card areas scored, Area IX, Administration and Organization of Class Program, was highest with a mean score of 10.4. Area VII, Medical Examination and Health Service, was lowest with 4.5 points. Area III, Indoor Areas, was found to be most related to total score with a correlation coefficient of .913.

When studied by means of the Votaw Curve technique, 52 items were found to be discriminative of the quality of the health and physical education program.

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Dynamic Balance in Adolescent Boys

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IN A RECENT article on physical abilities in adolescence, Jones (7) observed that with the onset of puberty the development of certain types of coordination, balance, and agility in boys is apparently temporarily retarded. Results obtained by Dimock (2) using the Brace test, for example, showed prepubescent boys to be actually superior to pubescent and postpubescent boys of the same chronological age. Jones (7) studied growth in motor ability (Brace test) in relation to skeletal age and noted a lag or even a recession at around the skeletal age of fourteen years, when a large proportion of boys are becoming postpubescent. Espenschade (4) tested two groups of boys and found negligible gain in Brace test scores between the chronological ages of 12.5 and 14 years.

Reorganization of the Brace test data for 58 cases[1] of the California Adolescent Study (3) to group boys by pubescent status does not give the same results as Dimock obtained but it does support his conclusion that motor ability tends to increase less rapidly in the period during which puberty is reached (Fig. I). These same data are summarized in somewhat different fashion in Table 1.

The general pattern shows each advancing stage of maturity to be superior to the preceding except for the few cases which mark the earliest appearance of a stage or level. For example (see Fig. I), at 13.25 years, I is superior to II; at 13.75, II is superior to III; and at 15.25, III exceeds the postpubescent average. Again (see Table 1), the relatively small number of scores of boys who are fully mature by 16 years average less than those of stage III. Whether the explanation lies in special stress imposed by growth changes with consequent effect on physical abilities or in sampling errors owing to the few cases in these early stages cannot be determined from the data.

When the Brace Test was analyzed into sub-classes and age development in each of these studied (4), it was found that all tests which showed a characteristic "adolescent lag" in boys' scores had the factor of dynamic balance in

[1] These same individuals were tested semi-annually over a four-year period.

common. Because boys grow very rapidly at puberty with consequent changes in physique and body proportions, it seems reasonable to believe that balance may be disturbed at this time. In order to test this hypothesis, two studies (1) (8) of dynamic balance in adolescent boys were made.

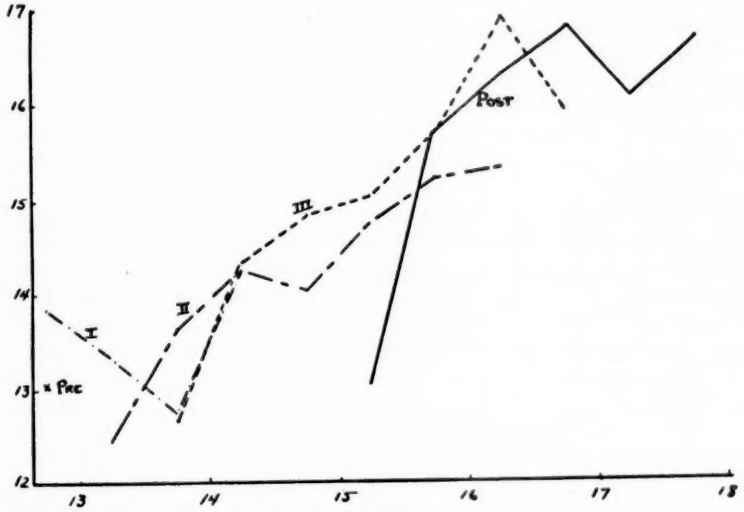

Fig. I. Brace Test Scores in Relation to Age and Maturity. Three stages of pubescence are indicated by Roman numerals.

TABLE 1

Average Scores on the Brace Test According to Physiological Maturity

Stage of Maturity	Age 12.5–16			Age 16–18		
	No. of records	Brace		No. of records	Brace	
Prepubescent	1	13.0				
I	36	13.3				
Pubescent II	155	14.0	14.2	7	15.2	15.6
III	68	15.1		32	16.0	
Postpubescent	19	14.5		65	16.4	

At the time these investigations were started, the only study of dynamic balance showing age changes in boys was that of Seashore (9). Thirty boys at each year of age, 5 to 19, were tested on beam walking. No improvement in scores from 11 to 17 was noted. More recently Heath (6) has presented data on a different railwalking test for ages 6 to 14 inclusive which show continuing improvement each year. Median scores suggest a slackening in rate of gain from 12 to 14 but this does not appear when mean scores are used. Numbers of cases at each age level range from 30 to 53.

Procedure

Preliminary experimentation (1) with the Seashore beam walking test showed it to be interesting to adolescent boys, easily administered and scored. Four beams were found to be sufficient to allow every boy to score and no one to make a perfect score. The beams were ten feet long, four inches high. The widths were 2¼, 1½, ¾, and ⅜ inches respectively. Subjects were instructed to walk the four beams five times, starting on the widest beam and continuing on the progressively narrower beams. One practice trial on the widest beam was permitted. Subjects walked heel to toe, with hands on hips. All boys wore tennis shoes. At the first fall-off or error, they were instructed to step back on the beam at the same place and to continue walking. At the second fall-off or error, the trial was complete and the boy returned to the start. Rest was permitted at any time between trials but few subjects chose to rest.

Scoring was done as reported by Seashore, with four points possible for each beam. Four beams and five trials made possible 16 points for each trial and 80 for the entire test. The reliability of this length test was found to be .87 and agrees well with figures reported by Seashore for adult men. Mean scores did increase slightly with each trial but the increment declined steadily (Table 2).

TABLE 2

Beam-Walking Scores by Trials

No. 235		
Trial	Mean	Sigma
1	10.2	2.7
2	10.8	2.7
3	11.3	2.8
4	11.6	2.5
5	11.9	2.8

Because this length of test was highly reliable and a longer test seemed inadvisable because of time, fatigue effects and possible loss of motivation on the part of the subjects, additional trials were not given. When the testing was repeated a year later in the same school some of these same boys were retested. The test-retest correlation for these cases was .80. No evidence of learning appeared, however, as there were no significant differences found between scores of these boys and those of grade-groups made up of different boys (critical ratios approximated .5).

Results

Results obtained for each year of testing were similar and have been combined in Table 3. Although scores show a consistent gain with age, the rate of change from 13 to 15 is much less than that which occurs earlier or later. This same "lag" appeared in both sets of data collected a year apart so it seems doubtful that sampling can be the cause.

TABLE 3

Beam-Walking Scores by Chronological Age

No. 476

Age	No.	Mean	Sigma
11.5	20	49.5	8.8
12.5	118	52.5	8.9
13.5	137	55.6	9.0
14.5	151	56.2	10.1
15.5	46	59.9	13.5
16.5	4	62.5	

In order to relate balance to maturity, all boys were classified according to the system presented by Greulich and associates (5). Five maturity groups are described, the first of which may be referred to as prepubescent and the fifth as approximately mature. These five classes do not correspond exactly to those used in the California Adolescent Study as the criteria are not identical.

Classification was practiced by the examiners and by assistants. Independent ratings of groups of 20 and 55 boys showed almost perfect agreement. The correlations were .99 and .98. Boys came to the examining room from physical education classes. They were asked to strip in order that they might be weighed and measured. Assistants took these measurements while the examiners classified the boys according to maturity level.

Balance scores according to maturity level are presented in Table 4. Boys classed as III are seen to have a lower average score than those in II. This same result appeared in both years of testing although it was more marked in one than in the other study.

TABLE 4

Beam-Walking Scores by Maturity Class

No. 476

Maturity	No.	Mean	Sigma
Prepubescent I	76	52.2	9.3
Pubescent II	109	55.6	9.6
Pubescent III	101	54.7	9.8
Pubescent IV	103	56.7	10.1
Postpubescent	87	57.6	11.8

Curves for each maturity class according to chronological age, are shown in Fig. II. No consistent order emerges between maturity groups. It may be noted, however, that the pre- and post-pubescent curves both rise sharply while the three intermediate levels show little gain.

Correlation of the beam walking test with chronological age was .27, with height .04, with weight −.02, and with maturity level .12. Balance scores for extremes in height and weight were as follows:

17 boys, 4 ft. 6 to 4 ft. 10 inches tall	55.3
15 boys, 5 ft. 11 to 6 ft. 4 inches tall	57.1
16 boys, 70–82 lb.	54.4
16 boys, 148–205 lb.	50.6

In order to examine the relationship of balance as measured by this test to physical education activities, scores for 287 cases were correlated with assigned grades in physical education. The result was $r = .62 \pm .03$. The physical education instructors singled out ten boys whom they considered especially outstanding in "athletic ability" and ten who were conspicuously poor. Balance scores for these groups were 56.7 and 49.1 respectively. The relationship between dynamic balance and physical abilities appears to be substantial.

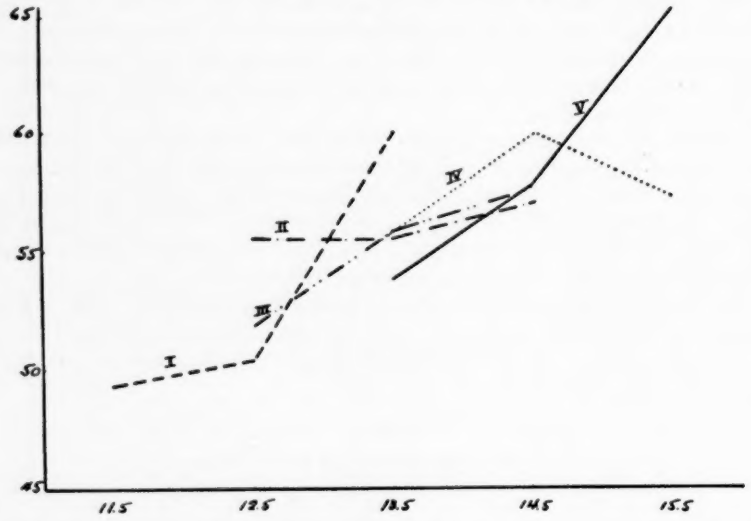

Fig. II. Mean Scores on the Beam Walking Test in Relation to Age and Maturity.

Summary and Conclusions

1. Studies of adolescent boys agree in showing a decrease at puberty in the rate of growth in motor ability as measured by the Brace Test. Dynamic balance has been found to be common to all stunts in the Brace battery which show a marked "adolescent lag." Since changes in physique and body proportions are relatively rapid at puberty, it is reasonable to believe that balance may be less stable at this time and that a decrease in rate of growth in this ability should occur in adolescence.

2. In order to test this hypothesis, two investigators selected a beam walking test developed by Seashore. A total of 476 tests were given in the same Junior High School in two years. The test was found to be highly reliable (.87).

Scores for boys retested after one year correlated .80 with the first test. No evidence of learning appeared after the one year interval.

3. All subjects were classified on the Greulich maturity scale. Height, weight and chronological age were recorded.

4. Results by chronological age show consistent improvement between 11 and 16 years but the rate of gain, 13 to 15, is noticeably retarded.

5. Results by maturity classification show a marked slowing of growth in the pubescent period.

6. Dynamic balance is not related to height or weight but correlates substantially with physical abilities important in the physical education program.

7. The hypothesis that growth in dynamic balance is retarded at puberty has been substantiated. Whether this function alone is responsible for the lag noted in Brace Test scores must be determined by further study.

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Student Injuries in Secondary Schools in Oregon

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THE PURPOSES OF this study were to analyze and evaluate the reported injuries occurring to pupils of the Oregon secondary schools who were protected by the Student *Mutual Benefit Plan Insurance.* Specifically, this study was also conducted: (1) to determine the incidence of injuries in regard to time of day; (2) to determine the incidence of injuries in regard to month of the school year; (3) to determine the type of injuries most frequently reported; (4) to determine the incidence and type of injuries with regard to organized and unorganized activities; (5) to determine the body regions and anatomical loci most frequently injured.

Background of the Study

Any elementary or secondary school, public or private, in the State of Oregon is eligible to participate in this Student Mutual Benefit Plan. Any number of students in a given school may be insured. Children are covered on the school grounds, in school buildings, in physical education classes, and while at or traveling to or from authorized school activities under the supervision of the school.

Injuries must be reported to the principal within 24 hours, except when the accident occurs on Friday, in which case they must be reported by 10:00 A.M. the following Monday. All injuries must be attended to by regular practitioners of surgery and medicine, or osteopathy and surgery, as licensed by the State Board of Medical examiners. This study did not include injuries occurring in athletics, since there is a special insurance plan designated for athletic competition.

The data collected in this study were obtained from the insurance files of the Oregon School Activities Office in Portland, Oregon. Through the use of these files, it was possible to obtain pertinent data in regards to student injuries occurring in the secondary schools of Oregon.

At the time of the injury, it is the duty of the person in charge to fill out a statement form including the following items: (1) the name of the doctor, dentist, or hospital giving treatment; (2) the name of the injured individual; (3) age of the insured; (4) nature of the injury; (5) date of the injury; (6) how the student was injured; (7) the place of the injury or where the accident occurred; (8) time of the injury; (9) when the injury was reported to the principal; (10) name and address of the school; (11) name of the person in charge at the time of injury; (12) the principal's name. On the reverse side of the form, the doctor, dentist, or hospital attendant describes

the injury, giving the character of the injury, extent, and complications, if any.

Procedure

The information collected was first recorded on standard 3 x 5 index cards, as follows: (1) the age of the student; (2) name and size of the school; (3) time of day injury occurred; (4) the month of the school year during which time the injury occurred; (5) the area of the body injured; and (6) the type of injury sustained.

The information on the cards was then transferred to a master chart which included the above items in detail. When studying the claim slips, it was found that some students sustained more than one injury in the same accident. Consequently, any table in this study which shows the ratio of injuries to the total number is computed according to the number of injuries per 100 insured individuals.

The injuries sustained were classified into ten types as follows: sprains, contusions, fractures, lacerations, infections, dislocations, abrasions, hematomas, sacro-iliac slips, and miscellaneous injuries not otherwise classified. For the purpose of analysis, body regions were divided into four parts as follows: upper extremity, lower extremity, head and neck, and the trunk.

Analysis of Data

During the 1948-49 school year,the Oregon School Activities Association enrolled 28,878 children in its Student Mutual Benefit Plan and of this number, 1,815 injuries were reported. There were, therefore, slightly more than six injuries reported for every 100 students that were insured.

From 7:00 A.M. to 8:00 A.M. was the safest hour of the day, with 0.5 per per cent of the total injuries. The injuries that occurred during this hour were caused through accidents sustained between home and school. The most hazardous hour of the day falls between 3:00 P.M. and 4:00 P.M.

February was responsible for 13.3 per cent of the total injuries. March, April, May, and October each accounted for approximately 12 per cent of the injuries, while January was responsible for 11.6 per cent. The fewest number of injuries occurred in June, September, and December.

TYPES OF INJURIES[1]

Physical education classes accounted for 52.9 per cent of all the injuries analyzed in this study. School buildings (hallways and stairs) and school grounds are shown to have the highest incidence of injuries with 13.8 and 7.7 per cent, respectively. Shop classes were responsible for 6.3 per cent;

[1]Injuries that occurred in noon-hour activities, physical education, intramurals, shop, classrooms, extracurricular activities, dressing rooms, and showers were arbitrarily classified as injuries occurring in organized activtities. Injuries that occurred in or on the school hallways, stairs, grounds, and during travel to and from school were likewise classified as injuries that occurred in unorganized activities.

TABLE 1

Types of Injuries According to Organized and Unorganized Activities

Type of injury	Noon hour activ.	Phys. edu.	Sch. bldg.	Sch. gro.	Un-known	Intra-murals	Shop	Class-room	Extra-curr.	Dress. room	To and from sch.	No. of injur.	% of injuries
Sprains	19	392	73	29	11	14	1	5	10	2	12	568	31.3
Concussions	16	289	64	38	7	7	11	9	9	8	36	444	24.5
Fractures	13	137	26	22	3	9	4	6	7	3	11	241	13.3
Lacerations	6	46	42	27	6	4	49	18	9	5	17	229	12.6
Infections	2	27	17	6	0	0	16	13	2	1	2	86	4.7
Strains	2	45	4	1	1	2	0	1	0	0	4	60	3.3
Abrasions	0	7	12	8	0	0	10	10	1	1	5	54	3.0
Foreign objects in eyes	2	7	2	3	0	0	19	1	0	0	4	38	2.1
Dislocations	0	31	2	1	0	1	0	0	1	0	1	37	2.0
Hematomas	0	12	4	3	2	0	1	2	0	1	0	25	1.4
Concussions	0	7	4	2	0	0	0	0	0	1	2	16	0.9
Sacro-iliac slips	0	3	0	0	0	0	0	0	0	0	0	3	0.1
Miscellaneous	0	7	0	0	0	0	3	1	3	0	0	14	0.8
Total	60	960	250	140	30	37	114	66	42	22	94	1,815	100.0
Percent	3.3	52.9	13.8	7.7	1.7	2.0	6.3	3.6	2.3	11.2	5.2		

TABLE 2

Injuries Sustained in Organized and Unorganized Activities According to Month of the School Year

Month of year	Noon hour activ.	Physical education	School building	School grounds	Unknown	Intramurals	Shop	Classroom	Extra-curric. activ.	Dressing room & shower	To and from school	No. of inj.	% of injuries
September	1	52	11	8	3	2	3	4	2	5	1	92	5.1
October	6	125	25	24	4	5	9	7	6	3	18	235	12.8
November	6	98	28	15	4	3	14	9	3	4	12	196	10.8
December	5	88	23	9	4	2	9	6	3	2	5	156	8.6
January	4	103	33	10	3	6	14	13	4	2	18	210	11.6
February	5	147	36	5	4	6	16	9	2	0	12	242	13.3
March	15	125	35	10	3	3	23	6	3	2	3	228	12.6
April	9	111	32	30	3	4	8	6	3	1	11	218	12.0
May	9	106	27	27	2	4	17	6	16	3	14	231	12.7
June	0	5	0	2	0	2	1	0	0	0	0	10	100.0
Total	60	960	250	140	30	37	114	66	42	22	94	1,815	0.5
Per cent	3.3	52.9	13.8	7.7	1.7	2.0	6.3	3.6	2.3	1.2	5.2		

to and from school, 5.2 per cent; classrooms, 3.6 per cent; noon-hour activity, 3.3 per cent; extracurricular activities, 2.3 per cent; and intramurals, 2.0 per cent.

Sprains, with 31.3 per cent of all the injuries, were found to be the most frequent type of injury in this study. Table 1 shows the breakdown of these injuries. Contusions were second most prevalent, 24.5 per cent; fractures and lacerations, 13.3 per cent and 12.6 per cent. These four types of injuries accounted for 81.7 per cent of the total injuries.

PHYSICAL EDUCATION INJURIES

Accidents in physical education classes were more than twice as numerous as those in other activities reported in this study, since they included 52.9 per cent of all the injuries. Table 3 gives the percentages of the injuries which occurred in physical education classes and the body regions that were affected.

TABLE 3

Percentages of Types of Injuries Incurred in Physical Education Classes and Body Regions Affected

Types of injuries	Head and neck	Trunk	Upper extremity	Lower extremity	Total
Sprains	1.4	6.8	14.2	18.5	40.9
Contusions	4.7	5.2	7.2	7.8	24.9
Fractures	3.5	0.4	8.2	2.2	14.3
Lacerations	3.2	0	0.7	0.9	4.8
Strains	0.4	3.6	0.1	0.6	4.7
Dislocations	0	0.2	2.3	0.7	3.2
Infections	0.1	0	1.0	1.7	2.8
Hematomas	0.4	0.1	0.2	0.6	1.3
Abrasions	0	0.1		0.4	0.7
Concussions	0.7	0	0	0	0.7
Foreign objects in eyes	0.7	0	0	0	0.7
Sacro-iliac slips	0	0.3	0	0	0.3
Miscellaneous	0.2	0.3	0	0.2	0.7
Total	15.3	17.0	34.1	33.6	100.0

The upper extremity was the body region most frequently injured. It was responsible for 34.1 per cent of all physical education injuries. The lower extremity was second in prevalence of injuries, with 33.6 per cent, followed by the trunk with 17 per cent and the head and neck with 15.3 per cent.

Sprains, responsible for 40.9 per cent of all physical education injuries, were the moest frequent type of injury. Contusions were second with 24.9 per cent, followed by fractures with 14.3 per cent. These three injury types constituted approximately 80 per cent of the total injuries sustained.

SCHOOL BUILDING INJURIES

Approximately 14 per cent of all injuries were sustained in hallways and stairs of the school building. The lower and upper extremities accounted,

respectively, for 39.2 and 38.4 per cent of the injuries affecting the body regions. The head and neck constituted 14.0 per cent of the injuries and the trunk 8 per cent.

The type of injury that most frequently occurred in hallways and on stairs was sprains, which made up 29.2 per cent of the total. Contusions were second, with 25.6 per cent, and lacerations third, with 16.8 per cent.

SCHOOL GROUND INJURIES

One hundred and forty (7.7%) injuries were sustained in school ground activities. The upper extremity was the most frequently injured region of the body, accounting for 41.5 per cent of all the school ground injuries.

DRESSING ROOM AND SHOWER INJURIES

Table 4 shows the results of injuries in the dressing room and the showers. These injuries constituted the lowest injury percentage of all the activities investigated in this study. Together they accounted for 1.2 per cent of the total injuries sustained. The region of the body most often injured was the lower extremity.

TABLE 4

Percentage of Types of Injuries Incurred in the Shower and Dressing Rooms

Type of injuries	Head and neck	Trunk	Upper extremity	Lower extremity	Total
Contusion	....	9.1	13.7	13.7	36.5
Laceration	9.1	....	....	13.7	22.8
Fracture	4.5	....	9.1	....	13.6
Sprain	....	....	4.5	4.5	9.0
Infection	....	4.5	....	....	4.5
Abrasion	....	4.5	....	....	4.5
Hematoma	....	....	....	4.5	4.5
Concussion	4.5	....	....	....	4.5
Total	18.1	18.1	27.3	36.4	100.0

TABLE 5

The Number of Injuries to the Body Regions Per 100 Insured Students

Body regions	Number of injuries	Number per 100 insured students
Upper extremity	703	2.4
Lower extremity	546	1.9
Head and neck	335	1.2
Trunk	231	0.7
Total	1,815	6.2

INJURIES TO THE BODY REGIONS FOR 100 INJURED STUDENTS

Of the 1,815 injuries analyzed in this study the rate of injury was 6.2 injuries for every 100 insured students. Table 5 indicates that 2.4 out of

every 100 students sustained injuries to the upper extremity. Approximately 2 out of every 100 students received injuries to the lower extremities. The head and neck region had a rate of 1.2 injuries per 100 insured students, while the trunk accounted for 0.7 per cent.

Findings

This investigation was instigated for the purpose of analyzing the injuries occurring to students of the secondary schools of Oregon who were insured by the Student Mutual Benefit Plan during the 1948-49 school year. The results were as follows:

1. Of the 28,878 insured students in this study, 1,815 injuries were reported, which constituted an injury ratio of 6.2 per 100 insured students.

2. The time of day accounting for the greatest number of injuries was from 3:00 P.M. to 4:00 P.M., with 14.5 per cent of total injuries.

3. Although injuries occurring during the months of the school year were rather evenly distributed, the month of February was found to have the greatest number of injuries, with 13.3 per cent of the total.

4. Physical education classes, with 52.9 per cent of the total injuries, more than doubled all other organized and unorganized school activities combined. Others in order of frequency were: school building, 13.8 per cent; school grounds, 7.7 per cent; shop, 6.3 per cent; to and from school, 5.2 per cent; classroom, 3.6 per cent; noon-hour activities, 3.3 per cent; extracurricular activities, 2.3 per cent; intramurals, 2.0 per cent, and dressing room and showers, 1.7 per cent.

5. Sprains, accounting for 31.3 per cent of the total injuries, were the most common type of injury. Contusions were second, accounting for 24.5 per cent. Fractures and lacerations were responsible for 13.3 and 12.6 per cent respectively. Other frequent types of injuries were: infections, 4.6 per cent; strains, 3.3 per cent; abrasions, 3.0 per cent; foreign objects in the eye, 2.1 per cent; dislocations, 2.0 per cent; and hematomas, 1.4 per cent. Concussions, sacro-iliac slips, and miscellaneous injuries not otherwise classified accounted for the remaining 1.8 per cent of the total injuries.

6. Ankles accounted for the greatest number of sprains with 33.1 per cent of the total injuries. The fingers accounted for 17.7 per cent of the sprains and the back 13.2 per cent of the total sprains. The fingers, accounting for 19.1 per cent of the total injuries, was the most frequently injured part of

the body. The ankles and the back with 11.6 and 8.6 per cent of the injuries were the next most frequently injured parts of the body.

7. The upper extremity, accounting for 38.5 per cent of the total injuries, was the region of the body most frequently injured. The lower extremity was second with 30.6 per cent of the total. The head and neck and the trunk regions were responsible for 18.3 and 12.6 per cent of the total injuries.

8. It was found that 2.4 per cent out of every 100 insured students had injuries affecting the upper extremity. There were 1.9 injuries per 100 insured pupils in the lower extremity region. The head and neck accounted for 1.2 per 100, while the trunk had 0.7 injuries per 100 insured students.

(Submitted 7-7-52)

Determining Healthy Growth for 4-H Club Members

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ONE *H* INSCRIBED upon the clover-leaf emblem of the 4-H Clubs means health. Health has long been an objective of the 4-H Club program. It has even been made a part of the Club ritual, in which each club member pledges "my health to better living."

Many people think that our generation is living better because we are freer from pain and disease, but other facts tend to show that we do not compare too favorably with our forefathers, who developed their bodies by vigorous outdoor life.

Most of us today are concerned about medical care. But health means more than absence from disease; it means a positive state of physical fitness and well-being (10). Health consists of at least four factors: (1) growth, (2) organic fitness, (3) motor fitness, and (4) body protection (17, 18). All four of these are given consideration in the fitness program for 4-H members in Illinois. But this report is limited to growth, and particularly to its measurement.

Purpose of the Study

This study should be classified as action research because it attempts to develop devices and technics for using growth data as criteria for fitness and to identify boys and girls who are growing too slowly or too rapidly and then to advise them regarding corrective measures (22).

Most current health activities have low interest values. Boys and girls have taken little responsibility for their own health; in fact, they have virtually said to the doctors and nurses, "You make me well." The results have been disappointing. Yet nature, society, and our own personalities all conspire to make us interested in the way we are growing up. During our first six years we must learn to eat, talk, walk, and otherwise control our bodies. These are muscular tasks. During the next six years we must learn to co-ordinate our movements more finely. During the third six-year period, our interests turn to physique, strength, attractiveness, stamina, and motor skills. These are some of the developmental tasks (19) each of us must learn if we are to grow up properly. These are the things we have found children to be interested in when they have been told the reasons "why."

Growth failures often bring serious consequences. Wetzel (31) found growth failures in 30 percent of the children he measured. He cited a case of a girl

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[1] *Acknowledgments.* The help of the following persons in the statistical analysis is gratefully acknowledged: Dr. Robert W. Touchberry, E. E. Hixon, Dr. D. E. Saunders, E. M. Haverland, and Lillian Haverland, all of the University of Illinois.

who had incurred a 250,000-calorie deficiency which took ten months of treatment costing $850 to correct. A survey in Britain found poor growth to be the principal reason for physical deterioration in the adult population (24). Many cases of obesity are due to faulty habits developed during youth.

Height and weight have long been used as measures of growth, but height-weight-age tables have not been found to be entirely satisfactory because they have failed to take into account different rates of growth by persons of different body types. Shuttleworth (27) attempted to account for this difference by dividing his group into different maturity classes. His growth curves resembled each other when matched by period of most rapid growth.

Growth Cycles

To measure healthy growth, one must understand growth cycles. The growth cycle is curvilinear, although during a short period it may appear as a straight line. Courtis (6) described the growth cycle as a period of specific maturation during which all of the acting elements and forces were constant. When modifying influences act, a new cycle is begun. Courtis (7, 8) writes the equation $Y = Ki^{r^t}$, in which K is the maximum at maturity, i is the decree of development at the beginning of the cycle, r is the rate, t is time, and Y is the achieved development at any specified time.

Courtis called the growth unit an "isochron." He changed isochrons to percentages by means of a table and then wrote the growth equation $Y = K[rt + i]$, which, he solved by simple arithmetic.

Scammon (25) showed a compound curve for height which consisted of three cycles, namely infancy, childhood, and adolescence. Theoretically any change in condition might cause a cycle, but a true cycle must be established by supporting evidence, such as the disappearance of baby fat, the growth in muscular tissue, the atrophy of the thymus, and the development of the genetalia, as occurs during the adolescence cycle (26).

Barach (2) summarized height and weight data for over 400,000 cases, which Baker (1) then smoothed into growth curves. We calculated the isochronic growth curves for the Barach data and have plotted them along with the curves for Illinois boys and girls as Figures II to V. These are compound curves, showing three cycles for Barach's data and two cycles for the Illinois data. The extensions of the simple cycle are shown by broken lines on Figures II to V.

The Growth Chart

In searching for a body-type index, Jorgenson and Hatlestad (21) compared 33 different indexes and concluded that the ponderal index ($\sqrt[3]{\text{weight}}/\text{height}$) devised by Levi was the most satisfactory. McCloy (23) found that this index and Wolff (32) found that a closely related one ($\text{weight}/\text{height}^3$) varied less with age than any other height-weight combination.

Since both height and weight are curvilinear growth curves, we plotted the ponderal index on double logarithmic paper and obtained the growth chart shown as Figure I (16).

In attempting to test this chart, we plotted the average height-weight classes for each age group in the Baldwin-Wood tables and the same kind of data for about 12,000 Illinois 4-H boys and girls and found that they followed closely the 76 body-type channel. We also obtained a straight line from the Harvard (11) growth data. These measures were repeated for ten years on the same persons, ages 7 to 17 years. When these boys and girls were separated into groups by period of most rapid growth, about 85 percent of them showed a spurt in height during a single year and a drop in index value for that same year.

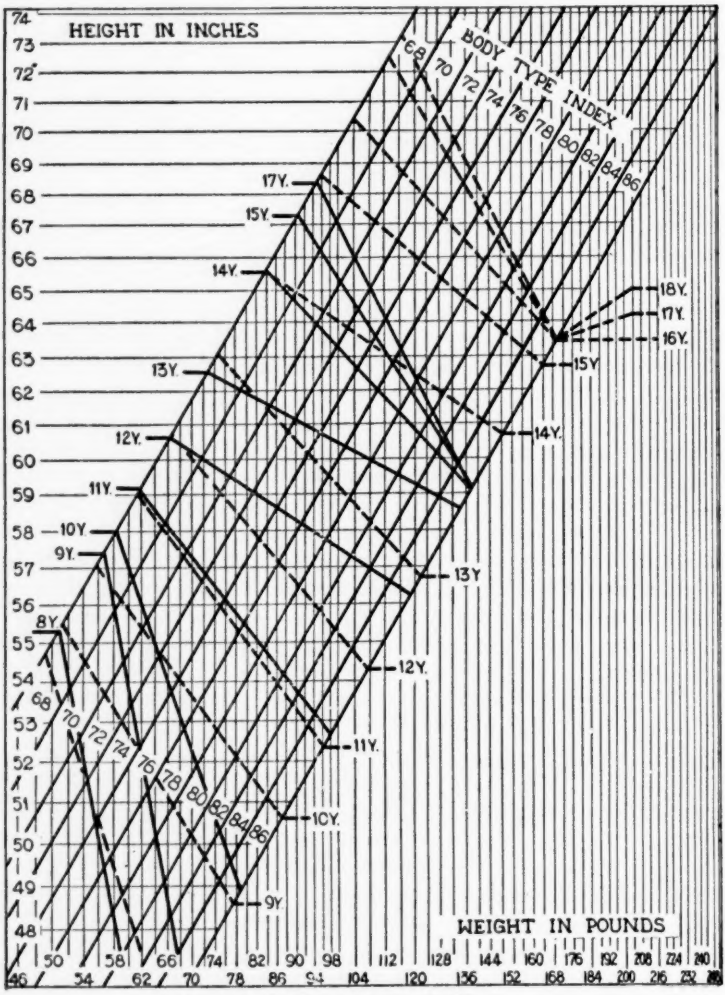

Fig. I. Body Type and Growth Chart.

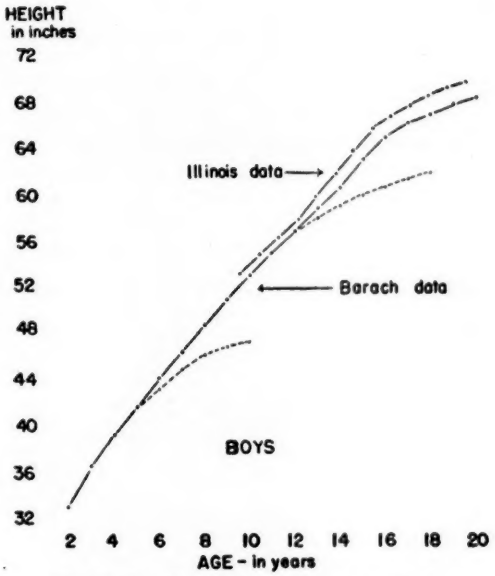

Fig. II. Growth in Height of Boys. See Text.

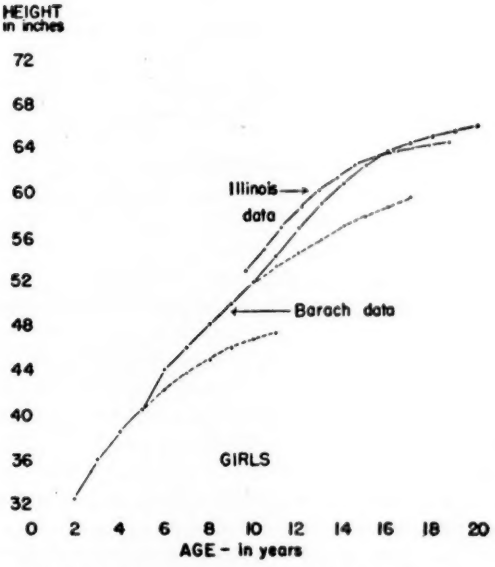

Fig. III. Growth in Height of Girls. See Text.

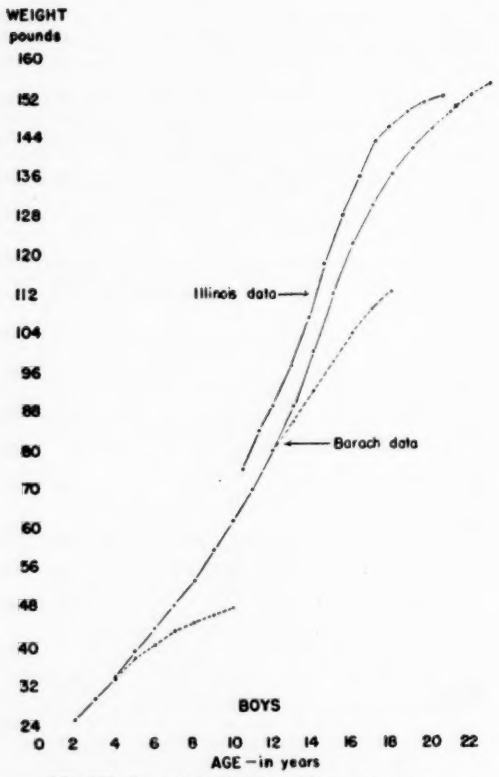

Fig. IV. Growth in Weight of Boys. See Text.

Brody (5) states that the acceleration in height identified as the preadolescent growth spurt represents a compensation for those children who were undernourished earlier in life. If this is the case, then healthy growth should show neither a spurt nor any drop in index value.

Wetzel (30) proposed the same argument in his grid for determining healthy growth. The ponderal index corresponds closely to his physique classes when plotted on the grid (15).

The evidence seems to indicate that the ponderal index should remain relatively constant between the ages of 10 and 19 years and that any change after maturity should be considered an indication of a loss in fitness.

At this point one naturally asks, "How far up channel should the growth line progress each year?" The answer is found in the lines crossing the body-type channels. The solid lines for girls and the broken lines for boys show the up-channel growth progress from year to year.

These cross-lines were adjusted slightly from two regression equations. First, from about 14,000 cards punched from the Harvard data, we calculated

the predicted weight for each height-body type-age group for both boys and girls. Then we followed the same procedure for the Illinois cross-sectional data. The predicted weights were almost identical. The predicted weights for each age were then plotted on the body-type chart, and the best fitting line was drawn through these points. These lines show the different rates of growth for the different body types at different age periods.

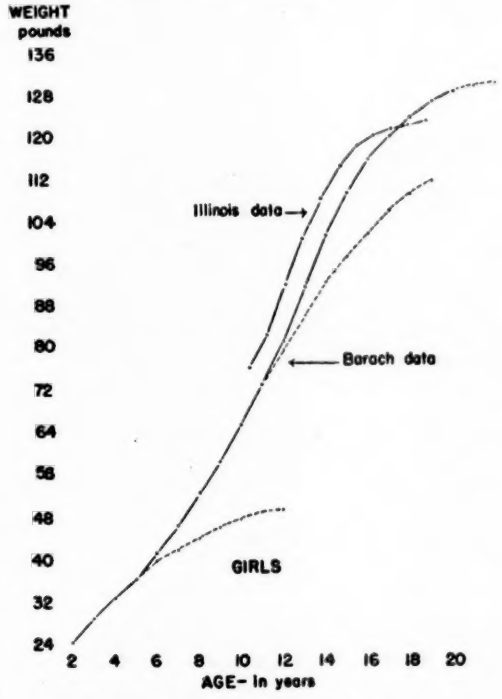

Fig. V. Growth in Weight of Girls. See Text.

Frequent plots of height-weight upon the body-type chart should form a straight line. Any deviation that crosses channels suggests the need for a physical examination to determine the cause. Thus, the body-type chart may serve as a screening device to select out those who may need treatment. Of course, such deviation should be checked against the other signs of unhealthy growth given by Turner (29), such as pale skin, dull hair, dark circles under eyes, spindly arms and legs, stringy or flabby muscles, pinched or anxious expression, dull eyes, slouchy posture, pale mucous membranes, decayed teeth, spongy gums, nervousness, poor concentration, disturbed sleep, and overweight.

One other problem must be solved before any height-weight growth chart can be used as an indicator of healthy growth. That problem is, "What is a

person's best weight?" Theoretically his best weight is his weight when he is in good physical condition. If his body is properly covered with fat and muscle, then his weight should be proportional to his skeletal size. If we use this best weight instead of actual weight in determining body type, then up-channel growth in this same body type channel is a sign of healthy growth.

Our problem then becomes, "How can we predict weight from skeletal measures?" McCloy (23) has discussed the measures that "have demonstrated their right to be included in the final battery" for predicting weight. Of those measures, we selected the following as possible for us to collect at the keeping-fit field days held in Illinois:

X_1 Standing height. Testee standing erect, barefooted, with hands on hips, and after taking a deep breath.
X_2 Sitting height. Testee seated with sacrum and head against the measuring stick, knees flexed, and with a full breath.
X_3 Knee width.
X_4 Hip width at iliac crests.
X_5 Chest width under the arm pits. Testee breathing normally.
X_6 Chest depth at sternal knotch. Testee breathing normally.
X_7 Age in months.
X_8 Weight in the forenoon, in light summer clothing, shoes and coats removed.

The knee, hip, and chest measures were taken with flat calipers according to techniques given by McCloy. Although we had little opportunity to re-

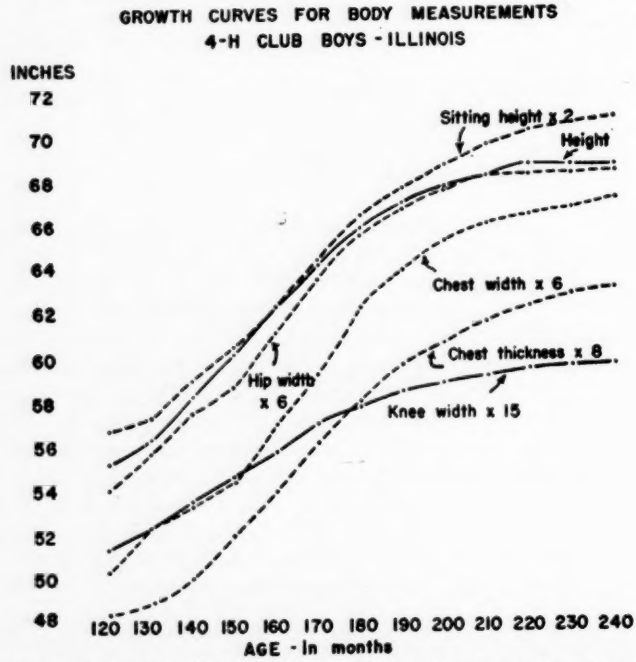

Fig. VI. Growth in Body Dimensions of 4-H Boys—Isochronic Growth Equations.

measure all individuals, upon several occasions we did remeasure some of them in order to make comparisons. The measuring was done by graduate students from the Physical Fitness Laboratory of the University of Illinois, who followed anthropometric standards. We had difficulty in obtaining similar height measures until we introduced the "deep breath," and we were very careful about "normal breathing" at the time we measured the chest. Hip width was difficult only on obese persons, and there we were very careful to reach the iliac crests.

The first six measures showed typical growth curves where plotted against age (see Figures VI and VII) and against weight. The differences in the shape of the curves for long bone and flat bone measures check with the findings of others. Davenport (11, 12) found that long bone growth ceases earlier than flat bone growth. Bayley (3) found height and body diameters to be relatively independent. Bean (4) found that the ratio of sitting to standing height changed with age.

The boys and girls who attended the keeping-fit field days were "run of the mill" in fitness. But because we wanted a fit sample from which to calculate our regression equations, we rejected all with body types above 80 and those 15 percent overweight and 10 percent underweight according to the Baldwin-

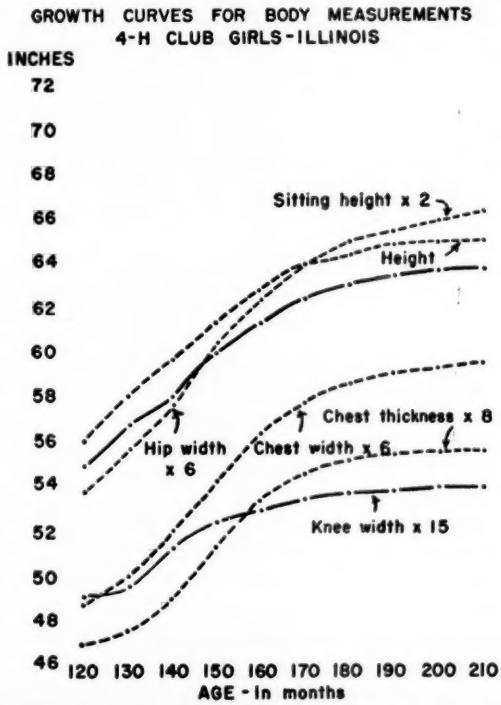

Fig. VII. Growth in Body Dimensions of 4-H Girls—Isochronic Growth Equations.

Wood tables. Furthermore, we rejected those who had standard scores under 30 on two strength tests— arm pull and broad jump. This was our way of eliminating the weak, underdeveloped, and fat individuals from our sample.

Since regression techniques are based upon linear relations, we scaled each variable to linearity by the following method. The mean weights for each frequency class, for each variable were plotted. We graphically fitted a smoothed curve through these points. Then we calculated by least squares the best fitting straight line through these points. The differences between the two curves at each class interval were added to or subtracted from each class lower limit to form new scaled values. The new scale had variable class limits. These scaled values were substituted for the original values and punched in each card. The correlation coefficients were calculated from the scaled values.

The correlation matrix rounded to four places is shown as Table 1.

TABLE 1

Correlation Matrix—Scaled Body Measures of 4-H Boys and Girls

Measure		X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Standing height	X_1	xx	.9326	.8717	.8508	.8424	.7383	.6795	.9561
Sitting height	X_2	.9078	xx	.8291	.8362	.8252	.7133	.6396	.9209
Hip width	X_3	.8073	.7734	xx	.7870	.8282	.7170	.6624	.8891
Age (months)	X_4	.7497	.7636	.7074	xx	.7993	.6761	.5474	.8596
Chest width	X_5	.7248	.7106	.7131	.6570	xx	.7442	.6646	.8726
Chest depth	X_6	.5853	.5675	.5628	.5076	.6269	xx	.5973	.7731
Knee width	X_7	.5457	.5191	.5254	.3854	.5651	.5036	xx	.6989
Weight	X_8	.7259	.8801	.8249	.7635	.7713	.6513	.5894	xx

Upper half = 1,959 boys Lower half = 2,418 girls

Partial correlation coefficients were calculated from the incomplete inverse matrix according to the abbreviated solutions outlined by Dwyer (14) and Johnson (20).

The multiple correlation coefficients are shown below:

	R^2	R
For boys	.94172491	.9704
For girls	.89988508	.9485

By reference to F tables we found the variance ratios for both boys and girls with n_1 = infinity and n_2 = 7 significant at less than the one percent level of probability and concluded that the multiple R's were significantly different from zero.

The standard partial regression coefficients were calculated, and the significance of each of the betas was tested according to the procedure outlined by Johnson. The betas, their t values, and their probability values as determined from Fisher's tables are given:

Standard beta	t	P less than	Standard beta	t	P less than
B_{81} = .4895	26.5491	.001	.5256	30.7055	.001
B_{82} = .1336	8.4939	.001	.1085	6.6716	.001
B_{83} = .0952	7.8352	.001	.1162	9.7999	.001
B_{84} = .0907	8.0586	.001	.0764	7.1144	.001
B_{85} = .1087	9.1272	.001	.0888	8.1888	.001
B_{86} = .0757	8.6686	.001	.0925	10.7348	.001
B_{87} = .0507	6.4245	.001	.0590	7.1020	.001

The partial regression coefficients used in the prediction equations were calculated as $b_i = B_i sy/si$, where $sy = \sqrt{Sy^2}/N - 1$ of the predicted variable, in this case and $si = \sqrt{Sx_i^2}/N - 1$ of the independent variables.

The multiple regression prediction equation may be written as $\hat{y} = \bar{y} + b_1(x_1 - \bar{x}_1) + b_2(x_2 - \bar{x}_2) + b_3(x_3 - \bar{x}_3) \longrightarrow b_7(x_7 - \bar{x}_7)$ which is easily reduced to $\hat{} = K + b_1x_1 + b_2x_2 + b_3x_3 \longrightarrow b_7x_7$.

The equation for both boys and girls were solved in terms of scaled values and were then converted to raw score values. The fiducial limit (.99) at the extreme of the predicted weight for boys was found to be ±.68 pounds. Since this was much smaller than we were able to weigh, we considered it not worth calculating for the girls.

In order to facilitate the calculations of a person's predicted weight, we prepared calculation tables for both boys and girls (available from author). The cells in the body of the table are the sum of the products of the raw scores times its partial regression value. One finds his seven body measurements in the margin of the tables and adds together the four intersecting cells and then subtracts the (K) constant factor. All cells in the table have one decimal place. The tabulation below will make clearer the use of the tables.

	Intersecting cells
Sitting height *31.0* × Standing height *59.0*	192.7
Knee width *3.5* × Hip width *9.0*	38.3
Chest width *9.4* × Chest depth *6.0*	40.6
Age, 161 months	14.9
Less constant factor (boys—196.2) (girls—184.4)	−196.2
Predicted weight	93.7

Earlier we had prepared calculation tables using all cases measured and without the kinds of rejections described above. These tables under-predicted many older boys who gave every evidence of being at a high level of fitness. The new tables permitted us to predict weights very close to actual weights on this group of boys.

We intend to use these tables along with the body type chart as a screening device, and then to examine those screened out for other evidence of unfitness.

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(Submitted 8-13-52)

Administrative Practices in Competitive Athletics in Midwestern Colleges

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IT IS GENERALLY recognized today that athletics are vital to college life and that they are an essential part of education. The desire to compete against each other, both as individuals and groups, resulted in intercollegiate athletics, the early attempts to administer the intercollegiate athletic programs bringing forth many of the problems which exist today.

The administration of early athletic contests was in the hands of the students; there were abuses. Faculties permitted athletics, provided they were in keeping with the type of behavior expected in other school activities and in the classroom. By 1870, athletics were firmly established in American colleges and interest from then on grew by leaps and bounds. A number of attempts to codify and regulate competition in various sports began; along with this came agitation for faculty control because of the great expansion and accompanying evils. It was during the period of 1886 to 1906 that many of the defects in college athletics, which are still in existence today, developed: hired coaches, recruiting, inducements for material, scholarship abuses, eligibility, subterfuges, etc. In an attempt to help remedy the intercollegiate situation, the National Collegiate Athletic Association (NCAA) was formed. But within, the college authorities realized that in order to obtain the results desired from the athletic program, it must be administered in much the same way as other branches of education. Control of athletics gradually came into the hands of the faculty. A number of changes for the better came about.

What is needed today is a gradual establishment through practice, experimentation, and research of a few general principles with which all men will agree. Because of an inherent desire to win, many administratiors have been unwilling to conform to these needed principles.

This study is concerned with present practices in competitive athletics in selected colleges of the Midwest. Certain tendencies and differences have been revealed which may or may not serve as a basis for recommendations and changes.

Statement of the Problem

The purpose of this study was to analyze the administrative practices in selected colleges of the Midwest and was concerned with the following problems: (1) to determine the present organizational status of competitive athletics in selected colleges of the Midwest, (2) to compare the administration of competitive athletics in the selected state supported and private col-

leges of the Midwest, and (3) to compile facts which will be of aid in evaluating administrative organization.

Methods and Procedures

The data for this study were selected from a comprehensive survey of current and authoritative writings concerning the administration of intercollegiate athletics and a checklist submitted to athletic directors of selected colleges of the Midwest with an enrollment of 3,000 or less. The checklist included 12 areas in the administration of competitive athletics: administrative organization, personnel, teaching load, regulations for contests, financing, awards, officials, publicity, athletic injuries, transportation, tickets, and eligibility. Only colleges that offered varsity competition in three major sports were included in the study. The checklist was returned by 126 out of 142 of the colleges asked to participate, representing an 88.73 per cent return. Of 126 returns, only 119 were tallied, of which 28 were state-controlled colleges and 91 were privately endowed colleges.

Results and Findings

ADMINISTRATIVE ORGANIZATION

Table 1 gives the percentage of colleges following certain administrative practices. It was found that 61.3 per cent of the selected colleges in the Midwest have a combination athletic director and physical education director as the type of departmental leadership, with the department of athletics wholly inside the department of physical education in 77.3 per cent of the colleges. Only 21.9 per cent of the colleges stated that the department of athletics was entirely independent and outside of the department of physical education.

TABLE 1

A Comparison of Administrative Organization and Practices in Competitive Athletics and Physical Education in 119 Colleges in the Midwest

Organization	91 private colleges	28 state colleges	Total
		(*In percentages*)	
1. Colleges having a combination athletic director and physical education director	63.7	53.6	61.3
2. Department of athletics within the department of phsyical education	79.1	71.4	77.3
3. Faculty board of control for athletics	68.1	50.0	63.9
4. Faculty-student board of control for athletics	15.4	42.9	21.9
5. Athletic board appointed by the president	67.0	78.6	69.8
6. Athletic director responsible directly to president	65.9	71.4	67.2

A board of control for athletics exists in most of the colleges, with 63.9 per cent maintaining a faculty board of control for athletics and 21.9 per cent a faculty-student board of control. This board is usually appointed by

the president and functions only for the government of athletics in 77.1 per cent of the colleges. The state colleges differ in that 42.9 per cent of the colleges have a joint faculty-student board which is a higher percentage than reported by the private colleges. In the majority of colleges the faculty or faculty-student board of control for athletics has written policies on the following items: eligibility, scholastic standing and requirements, schedule limitations, budgets, and athletic awards. Direct administrative control is strengthened by the fact that in 91.6 per cent of the colleges the athletic director is directly responsible to the president or board of control for athletics.

COACHING PERSONNEL

Certain qualifications are found to be more common in the coaching personnel of the 119 colleges of the Midwest studied in this survey. Table 2 gives percentages on degrees held, rank, contracts, tenure, and training of 347 coaches.

TABLE 2

Qualifications and Contract Conditions of Coaches in 119 Colleges in the Midwest

Qualifications and Conditions	Private colleges	State colleges	Total
		(*In percentages*)	
1. Coaches holding Doctor's degrees	5.9	9.2	6.9
2. Coaches holding Master's degrees	64.3	75.2	67.7
3. Coaches holding Bachelor's degrees	26.1	13.8	22.2
4. Rank:			
Full professor	22.8	11.9	19.8
Associate professor	25.9	23.7	25.3
Assistant professor	27.9	23.7	26.7
Instuctor	23.4	40.8	28.2
5. Colleges giving same contract to coaches as members of academic staff	91.2	100.0	93.3
6. Colleges giving same tenure status to coaches	90.1	100.0	92.4
7. Coaches with undergraduate major in physical education	58.2	72.0	62.4
8. Coaches with graduate major in physical education	54.7	63.0	57.2

Note that 24 or 6.9 per cent of the coaches in colleges included in this study hold Doctor's degrees; 54 or 19.8 per cent of the coaches hold the rank of full professor. The rank of associate professor is held by 25.3 per cent of the coaches; assistant professor, by 26.7 per cent; and instructor, by 28.2 per cent. The private colleges have twice the percentage of coaches holding the rank of professor over the state colleges, but have only one-half the percentage of Doctor's degrees. The 67.7 per cent of the coaches holding Master's degrees in the 119 colleges of the Midwest compare favorably with the percentages reported by the teachers colleges and liberal arts colleges of the

North Central Association:[1] 77.04 per cent of the staffs in the teachers colleges and 64.18 per cent of the staffs in the liberal arts colleges hold Master's degrees.

Data derived from this study seem to indicate certain discrepancies in the qualifications and training of coaches in the 119 colleges. The fact that only 62.4 per cent of the coaches majored in physical education as undergraduate students, and only 57.2 per cent as graduate students, seems to indicate a lack of professional preparation in the field of physical education, of which athletics is a part. This fact also seems to indicate that it is possible to obtain a coaching position in some of the colleges of the Midwest without professional training in physical education.

Of the 385 coaches coaching the four major sports, 230 (59.72%), have received three letters or more in college. The largest number of letters won by coaches as undergraduates was in football, basketball, baseball, and track followed in that order. Football and basketball coaches earned more letters in varsity competition.

The personnel status of coaches in the 119 colleges of the Midwest shows that 93.3 per cent of the coaches are given the same type of contract and 92.4 per cent have the same status regarding tenure as other members of the faculty. More money for coaching is given in 30.25 per cent of the colleges.

TEACHING LOAD

The data in this study reveals considerable difference between the teaching load of coaches, both when coaching and when not coaching. Figures I and II are bar graphs showing this difference. Head coaches in state colleges teach physical education classes 21.23 hours per week when not coaching and 14.34 when coaching; head coaches in private colleges teach physical education classes 13.9 hours per week when not coaching and 12.05 per week when coaching.

Thus, a comparison of teaching loads and coaching loads in the private and state colleges revealed three differences: (1) head coaches in the state colleges teach a heavier load when not coaching than do head coaches in private colleges; (2) head coaches in state colleges have more weight assigned coaching duties than do the head coaches in the private colleges; this is evidenced by a greater difference between teaching load when coaching and teaching load when not coaching; and (3) the head coaches in the state colleges carry a much heavier load either when not coaching and just teaching physical education theory or service classes or when coaching and teaching either a lessened program of physical education theory and service classes or no classes whatsoever.

Table 3 gives the four methods used most extensively in financing the athletic program in the colleges responding: annual appropriation, purchase

[1]North Central Association of Colleges and Secondary Schools, *Revised Manual of Accrediting.* Commission on Institutions of Higher Education, 1941, p. 10.

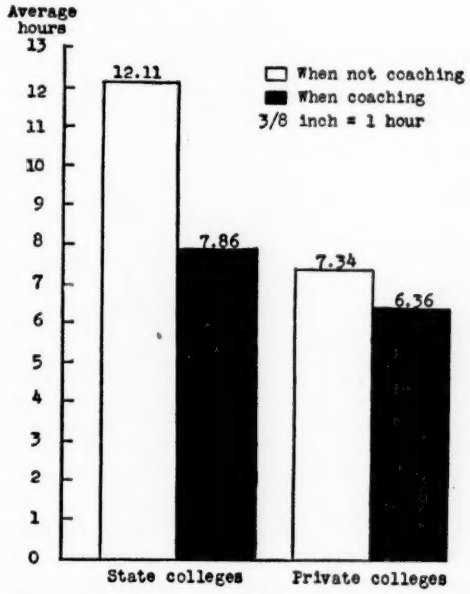

FIG. I. Average Number of Hours Per Week Head Coaches Teach Physical Education Service Classes.

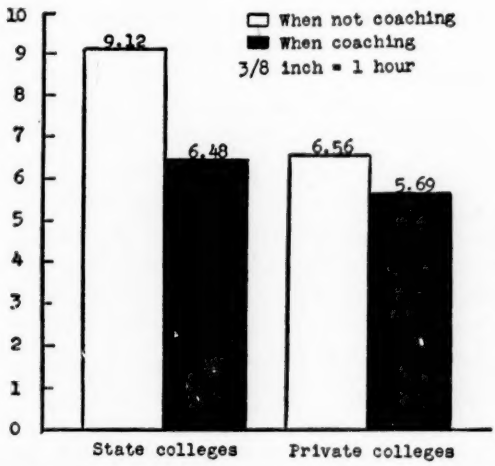

FIG. II. Average Number of Hours Per Week Head Coaches Teach Physical Education Theory Classes.

of activity tickets, student athletic fees, and gate receipts. One-half of the private colleges obtain 53.1 per cent of their athletic funds from annual appropriation, in contrast to 17 per cent reported for the state colleges. Football contributes the most money to gate receipts, with 81 colleges reporting a percentage of 55.3 from this source.

TABLE 3

Methods of Financing Athletic Programs in 99 Colleges of the Midwest[1]

Methods	80 private colleges	19 state colleges	Total
		(*In percentages*)	
Annual appropriation	53.13	17.0	55.0
Activity tickets	35.0	58.3	45.0
Student athletic fees	45.0	40.0	45.0
Gate receipts	34.3	47.5	37.7

[1]Median used as a measure of central tendency.

Table 4 shows the percentage of colleges following certain financial practices. Note that approximately two-thirds of the state colleges place income from each sport in the general athletic fund—almost twice the percentage of private colleges following this practice. Not shown in Table 4 is the fact that 76.6 per cent of the colleges have athletic records audited by either state or paid auditors. Budgets are maintained by 91.6 per cent of the colleges. The college treasurer has final authority to sign checks in whole or in part in 77.3 per cent of the colleges.

TABLE 4

Financial Practices in Competitive Athletics in 119 Colleges of the Midwest

Financial practices	91 private colleges	28 state colleges	Total
		(*In percentages*)	
1. Financial reports made:			
a. Annually to administration	54.9	35.7	50.4
b. At end of semester or quarter	13.2	32.1	17.7
c. At end of sport season	11.0	14.3	11.8
2. Financial reports made to:			
a. President	44.0	28.6	40.3
b. President and athletic board	27.5	57.1	34.5
3. Paid auditors employed	74.7	53.6	69.7
4. Income from each sport allocated to:			
a. General college fund	53.9	28.6	47.9
b. General athletic fund	35.2	67.9	42.9

ELIGIBILITY

The percentage of colleges following certain regulations in regard to eligibility of athletes in competitive athletics is shown in Table 5. In addition to the information given in Table 5, it was found that only 25.2 per cent of the colleges do not allow athletes to compete with other teams in the same sport at all during the year. In 22.7 per cent of the colleges, an athlete is not allowed to compete with other teams during the season; 15.1 per cent allowed

TABLE 5

Factors Pertaining to Eligibility in 119 Colleges of the Midwest

Factors	91 private colleges	28 state colleges	Total
		(In percentages)	
1. Freshman participation allowed	93.4	100.0	95.0
2. Any part of one game constituting one season of competition	82.4	85.7	83.2
3. Enrollment requirements for transfers of four-year colleges:			
a. One semester	20.9	25.0	21.9
b. One year	36.0	28.6	49.6
4. Enrollment requirements for junior college transfers:			
a. Immediately	74.7	85.7	77.3
b. After one year	15.4	3.6	12.6
5. Athlete participation on professional teams not allowed	89.0	67.9	84.0

competition with other teams during college vacations, and 17.7 per cent allow competition with other teams after the season ends. One college allows competition with other teams after the regular playing season begins. Over two-thirds of the colleges do not allow an athlete to receive money for competition; 21.0 per cent of the colleges allow an athlete to receive money for competition during the summer—usually in baseball.

The time an athlete must enroll to be eligible varies. In 28.6 per cent of the colleges, an athlete must enroll on the college enrollment date; 23.5 per cent of the colleges require enrollment to be not later than one week after enrollment date. In 26.1 per cent the enrollment date may be three weeks late.

An athlete is not allowed to receive money for coaching any sport in three-fourths of the colleges. An athlete is allowed to receive money in the sport in which he does not participate in 10.9 per cent of the colleges, and 11.8 per cent of the colleges allow an athlete to receive money for coaching any sport. An athlete is not allowed to receive money for officiating any sport in one-third of the colleges.

GAME REGULATIONS AND CONDITIONS

Table 6 gives percentages of colleges following certain practices in regard to game and playing conditions. Note that most colleges play a 20-22 game schedule in basketball, an 8-9 game schedule in football; in addition it was found that most colleges have a 12-16 game schedule in baseball and from 6-8 track meets. None of the colleges has summer football practice and 70.6 per cent of the colleges do not have spring football practice.

A greater percentage of the 119 colleges use private automobiles to transport the teams in basketball, baseball, and track. Football is the only sport in which a public carrier is used in the greater number of instances. The use of private cars for transporting the athletic teams subjects the college to the public utility and public liability laws of that state. Almost one-third of the

colleges reported no insurance coverage when private automobiles were used to transport athletic teams.

TABLE 6

Game Conditions and Regulations in 119 Colleges of the Midwest

Conditions and regulations	91 private colleges	28 state colleges	Total
		(In percentages)	
1. Games scheduled per season:			
(a) 20-22 games in basketball	57.1	75.0	61.3
(b) 8-9 games in football	74.7	78.6	75.6
2. Post-season games played in:			
(a) Basketball	30.8	42.9	33.6
(b) Football	8.8	10.7	9.2
3. Eligibility lists exchanged before season starts	63.7	64.3	63.9
4. Athletic trainer:			
(a) Student	37.4	25.0	34.5
(b) Coach	24.2	17.9	22.7
5. Athletic injuries cared for by:			
(a) College physician	52.8	32.1	47.9
(b) Private physician	18.7	21.4	19.3
(c) Both	27.5	46.4	31.9
6. Physician in attendance at all games or contests	52.8	60.7	54.6
7. Cost of injury assumed by college	74.7	82.2	76.5
8. Extent of insurance coverage for athletic injuries:			
(a) Not covered	48.4	60.7	51.3
(b) Covered entirely	20.9	7.1	17.7
(c) Covered partially	28.8	25.2	27.7
9. Faculty ticket sales manager:	48.4	75.0	54.6
(a) Records audited after each contest	53.8	64.3	56.3
(b) Ticket manager bonded	48.4	35.7	43.4
10. Awards granted on basis of meeting college requirements and coaches' recommendation	52.8	71.4	57.1
11. Awards financed through athletic fund	79.1	85.7	80.7

Conclusions

The following conclusions are based upon the results of the checklist survey of current practice in competitive athletics in the 119 colleges of the Midwest.

1. The majority of the 119 colleges in the Midwest include athletics within the educational structure.

2. The 119 colleges seem to have direct administrative control for athletics.

3. Coaching staffs in selected colleges of the Midwest are noticeably weak in the number of degrees above the Master's.

4. It would seem from the data collected that an undergraduate or graduate degree in physical education is not necessary for a coaching position in most of the 119 colleges studied.

5. Data on contracts and tenure indicate a uniform educational standard for coaches and academic faculty.

6. Earning letters as a player is a prerequisite for appointment to a head coaching position in that sport.

7. Coaching duties are not weighted as heavily in the private colleges as in the state colleges.

8. Colleges of the Midwest are not in favor of playing post-season games.

9. There is little uniformity in the bases for granting awards or in the types of awards given.

10. More emphasis seems to be placed on athletics in the state colleges than in the private colleges.

11. Athletic injuries seem to be the responsibility of the college either in whole or in part.

12. It would appear that inadequate protection for both players and drivers is maintained in those colleges using private automobiles to transport athletic teams but not having complete insurance coverage.

(Submitted 9-25-52)

Baseball Classification Plan for Boys

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LITTLE LEAGUE Baseball for boys, ages 8 to 12 years, has grown tremendously in participation and popularity during recent years (2, *p. 4*). The growth of baseball at this age level will undoubtedly create a big demand for its inclusion in the physical education programs of our elementary schools throughout the country. In its present status, there is considerable question whether the objectives and promotional methods and supervision of Little League Baseball are compatible with the aims and objectives of elementary school physical education.

Physical education teachers will no doubt soon be faced with the problem of adapting baseball at this age level, where necessary, to coincide with the aims and objectives of elementary school physical education and include the sport in their programs. The extensive Little League player selection system, (2, *p. 28*) which involves scouting of all prospective players by the managers of the teams in the league and buying players with points on an auction basis, could not be duplicated by the physical education teacher.

There appears then a probable need for a simple and economical but satisfactory classification plan—primarily for the physical education teacher but a measure which Little Leagues might also use to assist their managers in the selection of players. It was the purpose of this study to determine whether such a plan could be developed from the selected measures used in the study.

Procedure

Subjects were 64 boys, ages 8 to 12 years, participating in the 1951 Little League Baseball Program at Las Vegas, New Mexico. The following qualities were selected as essential to determine ability to play baseball at the 8- to 12-year age level:

1. Batting ability.
2. Ability to throw for distance.
3. Ability to throw for accuracy.
4. Ability to catch fly balls.
5. Ability to catch ground balls.

Each boy's final batting average for the 1951 season was used as the criterion for batting ability. A frequency distribution of the subjects' batting averages was constructed. Each subject was given a rating of one to five points, inferior to superior ability, on the basis of his batting average. The lower 10 per cent of the distribution received a rating of one, the middle 40 per cent a rating of three, the upper 10 per cent a rating of five, etc.

The subjects were subjectively rated on the other four qualities by 12 graduate majors in health and physical education at New Mexico Highlands University. The subjects were rated individually by each judge and given a rating of one to five points, inferior to superior ability, for each of the qualities they judged. The judges were instructed by the author to give consideration in their ratings to each boy's co-ordination and ability to handle himself with ease in performing these skills. Each boy's rating for batting ability, as indicated by his batting average, was multiplied by 12. The 12 judges' ratings for the other four qualities were then added to the "multiplied rating" for batting ability and a composite rating was given each subject.

Other than the fact that this study was concerned with a general age group, ages 8 to 12, nothing was done in the study to include age, height, and weight as classification factors. Age, height, and weight within the 8- to 12- year age group may or may not be significant factors in the classification of boys for baseball. Certainly, on the average, 12-year-olds will be superior in playing ability to 8-year-olds. However, if the plan were to show that age, height, and weight were significant factors in the classification plan, a study of all the boys engaged in an elementary school physical education program should be made for the plan to validly serve the physical education teacher.

This study was conducted on a group of boys who had the opportunity and desired to spend a large share of their free time during the summer playing baseball. The study was faced with this problem: Are the taller, heavier, 12-year-old boys who don't have an opportunity to play during the summer better baseball players than the shorter, lighter, 9-year-old boys who play baseball all summer long? Since there was no way to determine this in the study, the factors of age, height, and weight were disregarded. Little Leagues partially classify their players according to age by specifying that no team shall have on its roster more than five players, age 12, or less than five players, age 10 or younger (2, *p. 40*).

Subsequent to the ratings, the subjects were tested on the following qualities thought by the author to be possible measures of ability to play baseball at the 8- to 12-year age level.

Ability to throw for distance: Lines, five feet apart, were marked off from 50 feet to 200 feet beyond the starting line. Scorers were stationed on the lines 25 feet apart. The subjects could take a run before throwing but were not allowed to go over the starting line. Using Little League baseballs, the best throw of three trials was used as the subject's mark. Distances were recorded in feet.

Ability to run the bases for time: Little League baselines (60 feet between bases) were used. The subjects were instructed to place their forward foot on home plate and proceed to run the bases at full speed on the signal: *Ready-Go*. Only one trial was given unless the subject fell down or felt he could make better time on a second trial. All subjects wore light tennis-type shoes. Time was recorded by a stopwatch in seconds and tenths of seconds.

Motor educability: The Iowa revision of the Brace Test for Elementary School Boys (3) was used. This test was administered according to the directions given by McCloy (3, *p. 74*).

Treatment of Data

A comparison of the mean score for the subjects on the Iowa Brace test with the mean score for the norms established by McCloy indicated that the group tested was slightly above average in motor educability as might be expected from a group of boys voluntarily participating in an athletic program.

Zero-order correlations were computed by the product-moment method to obtain the relationships between the variables (See Table 1).

TABLE 1

Zero-Order Correlations

Test	Rating	Throw	Speed	Iowa Brace
Throw	.850			
Speed	.640	.694		
Iowa Brace	.463	.535	.562	
Mean	190.44 pts.	125.62 ft.	15.47 sec.	14.81 pts.
SD	43.46	25.21	1.29	2.80

Multiple correlations were computed by partial correlation techniques in an attempt to find the best classification index from the measures used in the study. When the measure of running the bases for time was combined with the baseball throw for distance, the correlation with the rating was raised from .850 for the throw alone to .853 for the combination. When the measure of motor educability was combined with the other two variables, the correlation with the rating remained at .853. The fact that the Iowa Brace Test added nothing as a predictor of baseball ability is in agreement with Everett's findings (1).

For practical purposes, the baseball throw for distance alone would be as good an index for classification purposes as any combination of the variables since any combination would increase the predictive index by only one-third of 1 per cent.

Twenty additional cases during the 1951 season and 67 additional cases during the 1952 season were obtained on the throw for distance, to make a total of 151 cases for the development of norms. The difference between the throws for 1951 and 1952 yielded a critical ratio of 2.14, which is rather high but not significant. A classification plan based on the usual range of six standard deviations with each division represented by 1.2 standard deviations is proposed for the baseball throw for distance (See Table 2). The standard deviation of the distribution is equal to 26.85 feet.

TABLE 2

Baseball Classification Index for Boys, Ages 8-12
Baseball Throw for Distance

Classes	Distance of throw
Superior ability	177 feet and over
Above average ability	145 - 176 feet
Average ability	113 - 144 feet
Below average ability	80 - 112 feet
Inferior ability	79 feet and under

Summary

Of the measures used in this study, the baseball throw for distance alone is the most practical measure to use for the classification of baseball players, boys ages eight to twelve, since the correlation with the rating was raised from .850 for the throw alone to only .853 for any combination of the variables.

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(Submitted 9-18-52)

Weight Training in Relation to Strength, Speed, and Co-ordination

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A GREAT DEAL has been said both for and against weight lifting and weight training as a means of conditioning athletes for optimum physical performance. Until recently, little evidence has been available to substantiate or refute the contention that weight training contributed to a loss of co-ordination and speed of movement owing to the overdevelopment of the musculartur e. However, recent studies seem to show a possible relationship between weight training and an increase in such factors as speed, power, and endurance.

Studies by Chui (2), Capen (1), and Wilkin (8) indicated that weight training did not produce any detrimental effects commonly associated with "muscle boundness," or muscle tightness as had previously been suspected. Rather, their work indicated a possible increase in power, speed, and endurance, although the evidence was by no means conclusive. Zorbas and Karpovich (9) found that weight lifters were faster than non-weight lifters in turning a single arm crank in a frontal plane. The evidence in these studies showed that the supposed loss of co-ordination and speed of movement commonly attributed to weight training was not present, but in actuality an increase in these factors had occurred.

Henry (4) found that strength was an important determiner of speed of movement in the sprint run, while Willgoose (7) found that a relationship existed between muscular strength and motor coordination among adolescents. On the basis of this evidence, it seemed logical to suppose that the development of strength through a systematic program of weight training would be accompanied by increased co-ordination and speed of movement.

Purpose of the Study

It was the purpose of the study, therefore, to determine whether increased strength gained through weight training was accompanied by an increase

[1] From the Physical Education Research Laboratory, The Pennsylvania State College. This study was conducted under a grant from The Council on Research, The Pennsylvania State College.

in muscular co-ordination and speed of movement. To test the hypothesis that increased strength was associated with increased speed and co-ordination, it was proposed to test these factors before and after a period of weight training and compare the results with that of a control group. Speed of movement as used in this study was defined as the rapidity with which a subject could complete 24 revolutions of the arm which described a clockwise circle in a frontal plane. Muscular co-ordination was defined as the ability with which an individual co-ordinated an eye stimulus with a muscular response where both speed and accuracy were essential factors.

Methodology

Subjects used in this study were male volunteers from the Freshman and Sophomore required physical education classes at The Pennsylvania State College in 1951-52. An experimental group (X) was composed of subjects who had chosen a beginning class in weight training as their required activity for an eight-week period. Students who had previous weight training experience were excluded from the study.

Two control groups were selected. The first consisted of volunteers from a beginning volleyball class. This group (*CV*) was selected since the activity in which they engaged was not considered to be as strenuous as weight training. The second control group (*CL*) consisted of volunteers from among those men who were required to attend a sports lecture course in lieu of any required physical education activity. This group, while not actively engaged in the required program, may have participated in outside activities as no attempt was made to control extracurricular participation, except that the control groups were asked to refrain from weight training.

A total of 69 subjects were tested at the beginning of the experimental period. These subjects were distributed as follows: 24 in the weight training group (*X*), 26 in the volleyball group (*CV*), and 19 in the sports lecture group (*CL*). However, owing to drop-outs and losses on the retest, the final data consisted of test-retest scores on 24 weight trainers in group *X*, 24 subjects in the volleyball group (*CV*), and 15 subjects who were not engaged in required activities, group *CL*. The reasons for the six subjects not completing the experiment were varied and it therefore appeared that no selective factor had operated to produce a bias.

To test the original hypothesis, that weight training increased strength with a possible increase in speed of movement and co-ordination, it was necessary to obtain adequate measures of strength, speed, and co-ordination. Since weight training developed primarily the arms and shoulder girdle, McCloy's revision of the Rogers' Strength Index (5) was used. McCloy found this to be an adequate measure of arm strength with a .95 correlation with the actual measured arm strength of males.

Speed of movement was measured in terms of the elapsed time required to complete 24 rotary movements of the arm in a frontal plane. An apparatus

similar to that used by Zorbas and Karpovich (9) was constructed. It consisted of a nine-inch crank to which a handle was attached. By means of a gear reduction train, movement of the crank activated a cam which in turn closed and opened a micro-switch, thus completing an electric circuit which started and stopped a .01 second chronoscope. The apparatus was adjustable, and was set to a uniform height for each subject. Resistance to rotation was negligible. Subjects started at their own discretion and moved the crank in a clockwise direction, turning the handle as fast as possible until 24 revolutions had been completed.

The reliability of this method of measuring speed of movement was determined through a test-retest of 30 subjects. Two groups of 16 and 14 subjects respectively yielded test-retest correlations of .62 and .84. The group of 16 subjects was tested and retested within a three- to five-minute interval. The group of 14 subjects was tested with a one-day interval between the first and second test. Since the primary purpose of this study was to analyze group differences, these reliabilities appeared sufficient.

An apparatus similar to that of Collins and Howe (3) was constructed to measure co-ordination. This consisted of a front target, which was a 3½-foot triangle, and a 1-foot square overhead target. Copper discs 2 inches in diameter were recessed in the targets, 6 inches from the corners of the triangle and centered in the overhead target. A fencing foil was wired in such a manner that contact made by the tip of the foil with any of the copper discs activated a counter. The subject stood at such a distance from the front target as to be able to touch any of the 3 discs at the completion of a lunging movement. The overhead target was adjusted so as to be directly over the shoulder of the hand in which the subject held the foil, and at a height 1 inch short of the extended reach with the foil.

At the starting signal, the subject alternately attempted to strike one of the copper discs on the front target, progressing clockwise, and the copper disc on the overhead target with the tip of the foil. Each subject was given 50 thrusts, alternating 25 thrusts at the front target, and 25 thrusts at the overhead target. The time required to complete 50 thrusts was recorded to the one-tenth of a second by a stopwatch, and the score assigned to the co-ordination test equalled the number of hits, divided by the total elapsed time.

Collins and Howe (3) in their original experiment used a total of 100 thrusts to measure muscular co-ordination. The reliability of the measure in the present study was determined by using both 100 thrusts and 50 thrusts. Two groups of 20 subjects were used, with an interval of two days between the first and second test. The test-retest correlation for the group which took 100 thrusts was found to be .72, while the reliability of the measure using 50 thrusts yielded a correlation coefficient of .76. It appeared from these data that the reliability of the measure was increased slightly by shortening the test, so the 50-thrust test was used in the investigation.

Measurements were taken with identical testing procedure during the first and last weeks of a regularly scheduled eight-week period of physical education. To avoid possible "loading" of the results, the subjects were not informed that they were to be a part of an experiment and that a retest would be given, until after they had completed the initial set of tests. The subjects in each group were all members of the same gymnasium class and motivation of maximum effort was gained through competition between the individual class members. Prior to the test, each subject was given a period of time to familiarize himself with the apparatus.

During the six weeks which comprised the actual experimental period, each group met for three 50-minute sessions per week. The average time, however, spent in activity during any one period was 30 minutes.

The weight training group (*X*) was given a program which stressed a system of body building in which groups of related exercises with moderate poundages and repetitions were practiced regularly. The program was based upon progression and each subject was urged to strive to increase the number of repetitions for each work period. No attempt was made to lift maximum poundages.

Control group *CV* engaged in learning the skills of volleyball with emphasis on fundamentals. Ample opportunity was given to practice the skills, and competition between teams selected from the class was stressed during the latter half of the six-week period. Control group *CL* did not engage in organized activity during the experimental period. They were assigned to a sports lecture course in which spectator participation in the major sports was covered.

Analysis of Data

Table 1 presents the means, standard deviations, and test-retest correlations for the measures of strength, speed, and co-ordination for the three groups, based on data collected at the beginning and end of the experimental period. With the exception of strength, the correlations were moderate to low. The test-retest correlations for speed and co-ordination tended to indicate a lack of uniform gain or loss during the experimental period for both the

TABLE 1

Means, Standard Deviations and Test-Retest Correlations for Strength, Speed and Co-ordination

Group	Strength			Speed			Co-ordination		
	Mean	S.D.	r	Mean	S.D.	r	Mean	S.D.	r
CL I	577.37	78.05		6.01	.49		.62	.17	
II	590.31	82.12	.94	5.98	.34	.32	.67	.14	.74
CV I	567.21	63.89		6.27	.35		.45	.14	
II	576.73	62.74	.98	6.38	.55	.74	.54	.17	.48
X I	570.04	67.19		6.10	.45		.46	.14	
II	592.51	66.57	.99	5.88	.42	.49	.62	.14	.36
All Groups									
I	570.71	68.83		6.15	.33		.50	.16	
II	585.98	69.57	.97	6.10	.43	.55	.60	.16	.54

control and experimental groups. In the strength test, however, there appeared a high level of consistency between first and second test scores.

DIFFERENCE BETWEEN GROUPS

The differences between means of the groups for the first test (Table 2) indicated that the three groups were reasonably well matched in strength and speed. A possible difference in favor of the experimental group (*X*) over control group *CV* was indicated in speed. While this difference was below the .05 level of confidence, it indicated that control group *CV* tended to be slower. In interpreting the scores made on the speed test, it must be borne in mind that a larger score indicated a lower achievement in this factor, as scores were expressed in terms of elapsed time required to perform the specific task. It was also noted that control group *CV* was slower than

TABLE 2

Differences Between Means of Groups on First Test

Groups	Strength	Speed	Co-ordination	*t* required at .05 level; .01 level	
X-CL	−7.33	.09	−.16		
t	.29	.56	2.96	2.03	2.72
X-CV	2.83	−.17	.01		
t	.15	1.55	.24	2.02	2.69
CL-CV	10.16	−.26	.17		
t	.41	1.73	3.15	2.03	2.72

TABLE 3

Significance of Differences Between Test and Retest in Terms of "t"

Group	Strength	Speed	Co-ordination	*t* required at .05 level; .01 level	
X	11.35	2.42	4.85	2.02	2.69
CL	1.73	.23	1.62	2.04	2.76
CV	3.59	1.47	2.69	2.02	2.69

control group *CL*, the difference, however, being significant at less than the .05 level of confidence. No apparent reason was found to explain this fact, other than some lack of homogeniety between groups.

In the factor of co-ordination, the sports lecture (*CL*) was significantly superior to either the experimental group (*X*) or the volleyball control group (*CV*). Again, no apparent reason was found to account for the superiority of control group *CL*. Thus, the results of the *t* test showed the groups to be equated within the limits of chance in strength and speed, but not co-ordination.

COMPARISON OF GAINS

Examination of Tables 1 and 3 indicated that all groups increased in strength during the experimental period. Both the volleyball (*CV*) and experimental (*X*) groups showed significant gains which could be accounted for by the fact that both had engaged in physical activity. While the inactive

group (*CL*) did register a gain in strength, it was not significant at the .05 level.

In the factor of speed, the experimental group registered the only significant increase, that being at the .02 level of confidence. The gain made by the inactive group (*CL*) was negligible while the volleyball group (*CV*) was slower at the end of the experimental period, although not significantly so. This tended to indicate that strength gained through weight training may have resulted in more rapid speed of movement. However, the evidence to test the hypothesis that an increase in strength was associated with an increase in speed was inconclusive since a significant increase in strength by group *X* was associated with a significant increase in speed but a similar increase in strength in the volleyball group (*CV*) was not accompanied by a similar increase in speed.

All groups showed improvement in the factor of co-ordination; group *X* and group *CV* exhibited increases which were statistically significant. The apparent relationship between increased strength and increased co-ordination was found in this factor and tended to substantiate the original hypothesis.

A comparison of the gains and losses in strength, speed, and co-ordination made by the three groups is indicated in Table 4. Since the groups were not matched, two methods of computing the means and standard errors of difference between mean gains were considered. First, the actual gain or loss of each subject could have been computed and these new data used in finding the mean and standard error of difference between main gains for each group. However, since the correlation coefficients between the first and second test had been determined, Peters and Van Voorhis formula with the last four terms omitted (6, *p. 167*) was employed to compute the standard error of the difference between mean gains. This procedure was applicable in this situation as the groups were independent. Mean gains were computed by the straight-forward algebraic process of subtracting the means of the original distribution. Comparison of mean gains was accomplished by use of the *t* test.

TABLE 4

Comparison of Gains and Losses Between Groups

Groups	Strength	Speed	Co-ordination	*t* required at .05 level; .01 level	
X-CL	9.53	—.19	.11		
t	1.23	1.17	2.44	2.03	2.72
X-CV	12.95	—.33	.07		
t	3.91	2.74	1.49	2.02	2.69
CL-CV	3.42	—.14	—.04		
t	.43	.91	.88	2.03	2.72

When compared with either of the two control groups, the experimental group showed larger gains than either the inactive group (*CL*) or the volleyball group (*CV*) in all factors measured. The differences in gains be-

tween the inactive group (*CL*) and the experimental group (*X*) in strength and speed were not large enough to be statistically significant. However, a difference in gains in co-ordination, significant at the .02 level of confidence, was found between group *X* and group *CL*. The experimental group (*X*) showed gains which were significantly larger than the volleyball group (*CV*) in both strength and speed, while the gain in co-ordination was also larger but of considerably less significance. Comparison of the gains made by each of the control groups indicated no significant differences.

It would appear from these data that there was an indication of an existent relationship between increased strength on the part of the experimental group and increased speed and co-ordination. While the original hypothesis was not fully substantiated, the trend of the data favored it, since all of the gains were in favor of the experimental group (*X*) and, of the resulting *t's*, three were significant while the others were substantial but below the .05 level of confidence. This appeared to be consistent with the findings of Wilkin (8) where it was reported that the trend of the data favored the hypothesis that training with weights improved speed of movement.

INTERCORRELATION OF VARIABLES

An interesting point was raised when intercorrelations were computed between the factors studied. These appear in Table 5. These intercorrelations were computed using the raw scores of all subjects on the first and second tests. It can be seen that all were insignificant. This apparently indicated that the factors of strength, speed, and co-ordination as measured by the tests were independent of one another and that strength was not represented indirectly in the measurements of speed and co-ordination. The relationship between strength and speed approximates that found by Wilkin (8) and, when it is recalled that the raw scores in speed are in inverse relationship to actual achievement, the direction of the correlation is also similar.

TABLE 5

Intercorrelations Between Factors

Tests	Strength	Speed	Co-ordination
First			
Strength	—	.152	.019
Speed	.152	—	.002
Co-ordination	.019	.002	—
Second			
Strength	—	.100	—.017
Speed	.100	—	—.053
Co-ordination	—.017	—.053	—

Conclusions

From the data presented in this study, it appears that the contention that weight training contributed to a loss of co-ordination and speed of movement was refuted. Increased strength gained through a program of weight

training where moderate poundages and increased repetitions were practiced apparently bore some association with increased co-ordination and speed, although it was not demonstrated that increased strength produced better co-ordination or more rapid movement.

On the basis of the data collected and within the reliabilities of the measures used in this study, the following conclusions seemed warranted:

1. A six week period of weight training increased strength more than a similar period of volleyball or inactivity.
2. A larger increase in speed and co-ordination resulted from six weeks of weight training than from volleyball or inactivity for a like period.
3. Increased strength gained through training with weights was apparently associated with increased muscular co-ordination and speed of movement.
4. Individual differences existed in gains and losses in both speed and co-ordination, since the test-retest correlations for the total group of 63 subjects were .55 and .54 respectively. These differences were not peculiar to any one group, but existed in all three. Strength test scores appeared to be highly consistent with a test-retest correlation of .97 for the total group.
5. Training with weights for a six-week period had no apparent deleterious effect upon the subjects.

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Flexibility Measurements of College Women

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THE PURPOSES OF this study[1] were (1) to present flexibility measurements made on women of a college population; (2) to study ways of measuring hip rotation and back flexibility; (3) to study differences of flexibility with amount of activity, body weight, knee injury, and skill in the broad jump and obstacle course; and (4) to determine the effect of exercise on the flexibility of specific joints of the body.

Review of Literature

Flexibility in the human body may be defined as the amount of movement which can be achieved in a joint or articulation or the amount of movement which can be achieved through the use of a group of articulations. Numerous methods have been used for the purpose of studying joint measurement. In an attempt to standardize measurement procedure and terminology, Cave and Roberts (3) published diagrams and directions for measuring and recording joint function. Cureton (5) summarized the literature up to 1941, and Moore (17) gave a review of instruments which have been used for measurement.

Individuals in the physical education profession have established some flexibility tests which can be made without the use of a goniometer. Cureton (5, *pp. 388-9*) presented four flexibility tests which were standardized and for which norms were given. In these tests of trunk flexion, trunk extension, shoulder elevation, and ankle flexibility only calipers or a protractor were used for measurement. Hawley (11) used a modified protractor, called a spinal fleximeter, to deal with postural defects. This apparatus was restricted to work on spinal flexibility. Cotton (4) studied the flexibility of junior high school girls by using six tests or measuring devices which were easily applied with a protractor or a linear scale. Scott and French (19, *pp. 181-4*), in *Evaluation in Physical Education,* included two tests of hip and back flexion—1. the standing, bobbing and 2. sitting, bobbing. Kendall and Kendall (13) used a sitting-and-touching-the-toes test with 4,533 school children.

A variety of equipment and approaches have been used with studies on flexibility. In 1928 Taylor (21) measured the thigh and trunk flexibility of 20 college men with the use of Falconer's Arthrometer and the Taylor Flexometer. Benson (1), by means of a 360-degree protractor, measured joint

[1]This study was made in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Physical Education for Women, Graduate College of the State University of Iowa, Iowa City, June 1952.

movements of injured knees, ankles, and shoulders. From his study of diathermy he concluded that heat produced loss of tone in tissues and therefore allowed for greater mobility. Fisher's (7) study dealt with two groups of swimmers and he found significant differences in flexibility which paralleled group differences between varsity and freshmen swimmers. One of the more recent studies, that of Von Ebers (22), concluded that there was a relationship between reaction time and trunk flexion. However, a negative relationship existed between reaction time and shoulder flexibility. In this study the varsity athlete group ranked first in flexibility and reaction time and the phsyical education major group ranked second.

In 1937 Glanville and Kreezer (9) used a plumbline goniometer for the measurement of joint movements with ten subjects. Leighton (14), in 1942, used a similar instrument and named it the Leighton Flexometer. Norms based on 13 different movements by 56 college students were given by Leighton. Reliabilities, achieved through taking two successive measurements, ranged from .889 to .995.

Since 1944, a number of studies have been done with the Leighton Flexometer or an adaptation of this piece of equipment. Campbell (2) measured movements of the hip joint and found that exercise increased range of movement up to a certain degree and then had no further effect. Hupprich (12) used the Leighton Flexometer for 12 flexibility measurements on 300 girls ranging from six to 18 years of age and found that girls tended to increase in flexibility in most joints up to the age of 12. Flexibility, it was also concluded, is a specific factor unique for each joint. A number of other studies (8, 10, 18, 20, 23), with the use of the same instrument, have given comparable measurements on grade school boys, football players, baseball players, and male swimmers and basketball players.

Procedure

Techniques and equipment for this study were selected with the purpose of studying the application to normal subjects, which in this sense means that no subject would be sufficiently abnormal to be restricted from regular physical education activity classes. A gravity type of goniometer was used in taking all measurements of flexibility. An exploded view of the goniometer is shown in Figure I. The freely moving pointer, which is weighted at one end, is attached to the center of the instrument and points upward in a direction perpendicular to the floor when the instrument is held on its edge or even with the dial face tilted to as much as 45 degrees. This particular goniometer and leather strap together weigh less than ten ounces.

Measurements were taken on 130 college women who were selected at random from physical education activity classes. The age range was from 17 to 26, with a mean of 19½ years. Measurements were made on the right side only, without warm-up, and with the subject wearing shorts, blouse and tennis shoes. The instrument and purpose of the experiment were explained to subjects before starting.

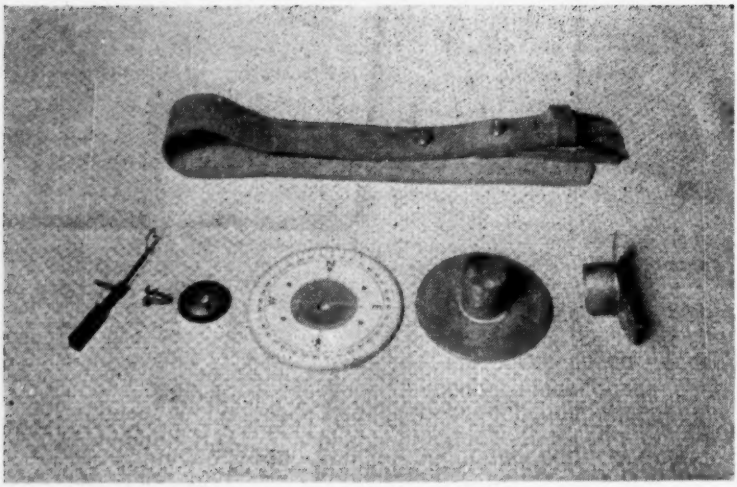

Fig. 1. Exploded view of goniometer. Parts from left to right: pointer; bearing; tension spring; dial face; back plate; mounting; (top) leather strap.

Twelve different joint movements were selected for study. Five of the measurements, that of trunk flexion, hip flexion, ankle flexion and extension, knee flexion, and shoulder joint flexion and extension, were made in a manner comparable to that used by Leighton (14). However, the latter study used trunk flexion from a standing position while in the present study the subject was placed in a supine starting position. The other seven methods of measurement, devised by the author of this study, were:

MEASUREMENTS MADE WITH SUBJECT IN STANDING POSITION

Total Back and Neck Extension. The S stood with toes, hips, chest, and nose touching the wall. With hands she grasped hooks on the wall close to her body and just above waist height. The goniometer, centered with the tragus of the right ear, was set at zero and strapped around S's neck. S was then instructed to bend backward as far as possible but to maintain contact with the wall with thighs and to keep knees straight.

Lumbar Extension. Procedure for this measurement was identical to the one above, but a web belt was used and the goniometer was placed at the S's right side at the crest of the ilium with the strap at the umbilical level.

MEAUREMENTS MADE WITH SUBJECT LYING SUPINE ON TABLE

Shoulder Joint Abduction. With S's right arm off table, shoulder joint at edge of table, and scapula on table, the goniometer was placed just above the elbow. Before setting the dial at zero, S's straight arm was placed at right angles to the long axis of the body and a board of the table height placed under the olecranon process. As the board was removed S was instructed to

reach down toward the floor in a transverse plane with her arm and even to reach back under the table if possible.

Scapular Abduction. With S lying supine on table, the goniometer was strapped around S's shoulder and under armpit with the dial face resting on top of the shoulder. The outer edge of the leather strap was in line with the acromion process. While S's arm was at her side, the dial face was set at zero. S was then instructed to keep both elbows straight, cross arms with right arm closer to face, and reach toward the ceiling. S pulled shoulder blades around while keeping arms straight.

Inward and Outward Rotation of the Knee. S's right hip, knee, and foot were bent to a 90-degree angle with thigh stabilized against a small wooden box. The goniometer was placed on the sole of the foot, with the leather strap fastened as close to the ankle as possible. The pointer was aligned with the long axis of the foot and zero set when the foot was in a perpendicular position. Movement was carried through by the administrator, who placed one hand on the S's heel and ankle and the other on S's lower limb.

Inward and Outward Rotation of the Hip from Supine Position. With S's right leg in a straight line parallel to the long axis of the body, foot projecting a little beyond the table and at a right angle to the leg, the goniometer was placed on the sole of the foot. The whole leg was rotated in as far as possible and then out as far as possible. S was cautioned not to bend knee, move ankle joint, nor to shift hips during this measuring.

MEASUREMENT MADE WITH SUBJECT SEATED AT EDGE OF TABLE

Inward and Outward Rotation of the Hip from Sitting Position. S's thighs were on table, lower limbs off table, and hands at edge of table on either side of legs. The goniometer was placed on the lower right limb just below the knee and S's leg position was adjusted so the knee was aligned with the hip when the dial face was set at zero. An inward, or medial, and then an outward swing of the lower limb was made by S, who was instructed to avoid shifting body weight or lifting the right thigh from the table.

Reliability was determined by immediate retest of 50 of the first 90 subjects and with the use of new score cards. Test retest product-moment correlations are shown in Table 1. Four of the reliability coefficients were between .70 and .80. Three of these measurements were of arm and shoulder movement. The fourth measurement was that of knee flexion. It was believed that reliability on arm and shoulder movements was low because of the many different planes of movement possible in the shoulder joint and shoulder girdle and the difficulty in localizing action. It seemed most difficult to establish a controlled starting position for arm movements since any variance in shoulder girdle position contributed to the change of starting position. These findings correspond with those of Moore (17) who used a double-armed universal goniometer. In the measurement of knee flexion, it was believed that hyperextension of the pelvic girdle along with the knee flexion lowered reliability.

TABLE 1

Reliability Coefficients and Measurements of Central Tendency and Variability for the Twelve Joint Movements

Measurements	Reliability Coefficient	Mean[1]	Standard deviation[1]	Range[1]	Median[1]
	N–50	N–130	N–130	N–130	N–130
Trunk flexion	.92	133.00	15.10	99-188	134.79
Hip flexion	.92	104.62	10.68	69-135	105.05
Ankle flexion and extension	.84	70.05	9.24	52-96	69.90
Knee flexion	.77	104.38	9.06	75-130	105.58
Shoulder joint flexion and extension	.72	226.54	13.40	196-258	228.61
Total back and neck extension	.96	113.84	18.12	70-163	112.63
Lumbar extension	.92	35.87	10.26	12-65	34.44
Shoulder joint abduction	.73	52.14	8.82	30-75	51.90
Scapular abduction	.77	62.55	9.36	30-90	62.67
Inward and outward rotation of the knee	.84	80.34	16.48	50-120	81.07
Inward and outward rotation of the hip (Supine)	.82	145.14	22.80	75-210	154.34
Inward and outward rotation of the hip (Sitting)	.81	74.59	9.78	51-97	73.30

[1]Tabulated in degrees of motion.

Other information used for this study included a questionnaire on amount and kind of physical activity of subjects, and age, height, and weight of subjects. Subjects were also classified into majors in physical education and nonmajors, and a history of knee injury was taken. Scores achieved in the broad jump and obstacle race, two parts of the General Motor Ability Test (19, *pp. 193-197*), were taken from the Physical Education Department student record cards.

Analysis of Data

Shown in Table 1 are the mean, standard deviation, range, and median scores which were computed for the 12 measurements on 130 subjects. For the five measurements taken in a manner comparable to the studies done by Leighton (14) and Hupprich (12), the means found here approximated closely those previously reported.

Comparisons within various groupings of the raw data were studied by computing *t*'s on the following measurements: trunk flexion, hip flexion, ankle flexion and extension, total back and neck extension, lumbar extension, rotation of the knee, and rotation of the hip from both a sitting and supine position. The *t*'s, or significance ratios, were done by the formula for the significance of a difference in means of independent samples (15). The 130 subjects measured were used in various classifications as they met the criteria for the groupings. Study of the overlap of use of subjects in these groupings did not show evidence of any relationship of one classification with another.

Criteria were set up for use with the questionnaire in order to compare the flexibility of more active individuals with a less active group. Criteria for selection of the more active group included three or four years of high school physical education, participation in six or more physical education activities for a period of a school year or more, and participation in at least two of the following activities: baton twirling, drum majorette, cheer-leading, acrobatic dance, and ballet dance. Criteria used to select individuals for the less active group included participation in high school physical education for two years or less, participation in none of the activities specified above for the more active group, and participation in only four or less of the 18 activities listed in the questionnaire. On a comparison of the eight measurements, the mean of the more active group was higher in every case except lumbar extension. However, only trunk flexion, total back and neck extension, and ankle flexion and extension were significant at the 5-per-cent level.

Comparisons were made between two groups of 15 subjects who were more than 15 per cent overweight or more than ten per cent underweight according to the McCall (16) Age-Height-Weight Table. Hip flexion, a movement which was naturally limited by adipose tissue, showed a statistical significance at the 1-per-cent level of confidence ($t = 2.85$) in the direction of the underweight individuals. The three measures in which the overweight individuals were higher—total back and neck extension, lumbar extension and trunk flexion—were all large body movements which involve the spine rather than a limited movement of one of the appendages. However, only one of these measures, that of lumbar extension, was statistically significant at the 5-per-cent level of confidence ($t = 2.41$).

On the basis of scores achieved in the broad jump and the obstacle race, significance ratios were computed for upper and lower quartiles (determined by *T*-scales for Motor Ability Tests for College Women, ref. 19, *pp. 203-204*) with each of the eight selected flexibility measurements. It was found that in the group to whom the flexibility measurements had been administered 47 fell in the upper quartile and 18 in the lower quartile of scores for the broad jump. In the obstacle race, 48 scores were in the upper quartile and 19 in the lower quartile.

For the broad jump, the measurement of hip flexion showed a t of 2.00 significant at the 5-per-cent level of confidence in favor of the upper quartile group. A t significant at the one-tenth per cent level was shown in trunk flexion in favor of the same group ($t = 3.55$). Other differences were not statistically significant. The same flexibility measurements showed a statistically significant difference in favor of the upper quartile in the obstacle race as in the broad jump. When the means for hip flexion and trunk flexion of the upper quartile group in the broad jump and obstacle race were compared with the means for the total number of subjects measured, the former were found to be slightly higher.

To compare the students who were majors in physical education with the nonmajors, t's were also computed. It was found that in the group measured

44 were physical education major students and 86 were not. The *t*'s were not significant for any of the eight flexibility measurements.

Twelve of the individuals measured reported having one or more knee injuries. The mean for flexibility of knee rotation for the 12 individuals was compared with the mean for the total group and gave a *t* of 1.85, the greater flexibility being in the knee injury group. Therefore, there was an indication, although not statistically significant, that individuals who have had knee injuries may have greater knee rotation than those without injuries. A *t* of 5.71, significant at the 1-per-cent level, was found on knee flexion with the larger mean being that of the total group. This was a statistically significant sign that the individuals of this population who have had knee injuries have less than the average amount of knee flexion shown in the population which was sampled.

Since there was wide discrepancy in the mean for hip rotation in a sitting position (74.59) and that for hip rotation taken from a supine position (145.14), it was decided to correlate these two measurements. This computation gave a correlation of .53. It is very likely that some foot motion and even some knee motion helped to increase the size of the mean for the supine position. However, instructions were given to hold the foot at a right angle in order to restrict measurement of movement to hip motion.

There is little in the literature to suggest any standards of difference here, but further study of skeletal structure seems to indicate that when the hip joint is placed in 90 degrees of flexion the acetabular rim and the bulk of the iliofemoral ligament restrict rotation in this joint. Then too, the possible effect of gravity in limiting motion in the sitting position should be given consideration.

To further study flexibility of movement in the back, a correlation of the dorsal and lumbar extension movements was made. In order to get a measurement of dorsal and cervical movement, the lumbar extension measurement was subtracted from the total back and neck extension measurement. When this result was correlated with the lumbar extension, it gave a negative correlation of .07. This indicates, for the individuals measured in this study, that there is no correlation between flexibility in one part of the back and another.

To study possibilities of increasing flexibility by exercise, an exercise program was set up for five movements: hip flexion, hip rotation, ankle flexion and extension, trunk flexion, and total back and neck extension. The exercise list was selected from simple exercises in common usage. Particular emphasis was placed on training each individual to make all movements in a relaxed, rhythmic manner, but to put special effort toward carrying the movement to the limit of her range of motion.

Subjects used for the exercise program were in the lower quartile on flexibility for the movements for which they performed the exercises. They agreed

to do the exercises daily for three weeks. Supervision was given for the first three times that each subject performed her exercise series. She was checked again at the beginning of the second and third weeks. The measurements were taken with the goniometer just before the exercise series was started, immediately upon completion of the three-week series, and once again eight weeks after the series had been completed. Table 2 shows the comparison of measurements with standard error of a mean difference (6). All *t*'s were significant at the 5-per-cent level or better for the comparison of before and immediately after the three-week exercise period. Hip flexion, total back and neck extension, and hip rotation remained at a significant level eight weeks after the exercise series had been completed.

TABLE 2

Comparison—Degrees of Motion of Flexibility Before and After Exercise

Measurement	Before exercise		After exercise		8 weeks after exercise		*t* Before and after exercise	*t* Before and 8 weeks after exercise
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Trunk flexion[1]	116.59	8.82	129.41	8.10	120.88	10.45	5.30	1.65
Hip flexion[1]	94.23	10.68	110.82	10.49	107.76	10.55	7.37	7.43
Ankle flexion and extension[2]	63.72	8.20	69.83	7.68	65.17	7.38	2.14	.51
Total back and neck extension[1]	93.41	6.76	102.70	9.51	100.12	9.97	2.69	2.60
Hip rotation (Sitting)[1]	63.23	6.80	82.88	11.51	76.70	14.80	8.62	3.56

[1]N = 17.
[2]N = 18.

Conclusions

The following points are derived from this study:

1. In comparing a more active and less active group, according to the criteria of this study, it was found that those individuals who had a past history of more activity tended to be more flexible. Measures of total back and neck extension, ankle flexion and extension, and trunk flexion were found to have a significant difference. However, a statement on cause and effect relationship cannot be made.

2. Comparisons were made on flexibility for underweight and overweight individuals. The mean of hip flexion for the underweight individuals was significantly greater than the mean for overweight individuals. The overweight individuals had a significantly greater mean for lumbar extension.

3. The upper quartile in the broad jump, or the better jumpers, and also those who were fastest in the obstacle race had a greater mean flexibility score in hip flexion and trunk flexion than the lower quartile group of the population represented in this study.

4. The comparison of physical education majors and nonmajors of the group studied did not indicate any significant differences in flexibility.

5. For the lower-quartile flexibility group of this study, significant increase in flexibility was achieved with mild exercises within a perod of three weeks'

time. Three of the five movements studied remained at a significant difference level eight weeks after the exercise period had been completed.

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(Submitted 5-31-52)

Substitution of ROTC for College Physical Education

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DURING THE SUMMER of 1952, the writer sent questionnaires to 364 colleges and universities in the United States listed as having Reserve Officer Training Corps (ROTC) units in operation. Three hundred and twenty-five (89%) of the questionnaires were returned and the answers to the questions included on these questionnaires provided the material for the data presented in this study.

Purpose of the Study

The purpose of this study was to determine the extent to which ROTC was substituted for required physical education in the various schools. Other data pertaining to extent of credit granted, length of physical education requirement, etc., were also obtained.

Findings

Of the 325 schools replying to the queestionnaire, 252 (78%) have a required physical education program ranging from one semester, or less, to four years. Fifty-one schools require physical education for one year or less, 180 for two years, 12 for three years, and 16 for four years. Of the 252 schools having a required physical education program, 90 (36%) permit the substitution of ROTC for physical education.

A similar study (1) conducted in 1950 indicated that 38 per cent of the schools having required physical education permitted substitution. There were 215 reporting schools in the 1950 study. Neither study indicated any significant geographical pattern of schools making substitution as these institutions are distributed generally over the country. The present study does show that the practice of substituting ROTC for physical education is more widely practiced in private than in state schools.

One hundred eighty-four schools granted academic credit for physical education, usually one credit hour for each semester. The number of semester hours' credit granted for participation in the ROTC programs ranged from none to 44. A few schools allow enough credit for a major in ROTC, while 21 schools grant no credit. The average number of hours' credit granted for ROTC by the 325 schools was 17.

It is interesting to note that of the 108 private schools reporting on the questionnaire, 83 (77%) have a required physical education program, but only 46 schools (42%) grant academic credit for participation in this sub-

ject. Of the 217 reporting state schools, 176 (81%) have a required physical education program and 138 (78%) grant academic credit.

In the matter of granting credit for ROTC, the private schools are slightly more liberal than the state schools, since 93 per cent of these schools grant academic credit as against 91 per cent of the state schools. Of the 21 schools granting no credit for participation in the ROTC program, 6 are private and 15 are state.

One hundred eighty-one institutions maintain a compulsory ROTC program for all male students and 139 schools require both physical education and ROTC. Some large institutions continue to have a variable policy regarding physical education and ROTC. Some divisions within the institutions may require physical education or ROTC, while others may not. For example, the College of Arts and Sciences may require physical education while another college within the institution may not require it. Present practices in regard to the administration of physical education and ROTC programs within our colleges and universities indicate a need for greater uniformity in this aspect of the curriculum.

Summary

1. Of the 364 institutions surveyed in this study, 325 (89%) returned the questionnaire.

2. Two hundred fifty-two (77%) of the schools have a required physical education program extending from one semester or less to four years. One hundred eighty schools (69%) have a two-year requirement.

3. Ninety (36%) of the schools having a required physical education program permit the substitution of ROTC for physical education.

4. The granting of credit in physical education is more widespread in state than in private schools, the percentages being 78 and 42 respectively.

5. This study indicates a need for greater uniformity in the administration of physical education and ROTC programs in our colleges and universities.

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(Submitted 11-5-52)

Kinesthetic Acuity and Balance Related to Wrestling Ability

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PREVIOUS WORK done by Honzik (2) with rats shows that the kinesthetic sense is important in at least some types of learning. This doee not mean that kinesthesis directly helps learning, as it was shown earlier by Ingebritsen (3) that, among rats with a sectioned cervical cord, kinesthesis was unnecessary both for learning and for the perfected maze habit and that learning on the basis of kinesthesis alone was impossible. However, Honzik points out that, where by itself kinesthesis may be relatively unimportant to maze learning, it seems essential to the smooth flowing of movements and assumes this function only in conjunction with other classes of stimuli and only after learning has begun on the basis of other stimuli.

Review of the Literature

In the field of physical education, one of the first studies on the relationship between kinesthetic judgment and success in basketball was done by Taylor (5) in 1933. He administered a battery of 14 tests to two groups of college basketball players. Each group was rated as either "successful" or "unsuccessful" depending on whether or not the individuals placed on the team. The tests were administered once to each individual. The compiled results indicated that the difference shown in single tests was of little significance. However, with the exception of one test (#14), they were all in favor of the successful group. The point was made that whereas the unit difference was of little significance, the aggregate differences were highly significant and the chances were statistically significant that the successful group was differentiated from the unsuccessful group.

In 1941 Phillips (4), in his study on the relationship between certain phases of kinesthesis and performance during the early stages of acquiring perceptuo-motor skills, found a low but positive relationship. From his results, he concluded that there seemed to be no basis for the phrase "general kinesthetic sensitivity and control." A few years later, Young (6) studied kinesthesis in relation to selected movements. Although her work was largely exploratory in nature, she found that there was apparently no relation between kinesthesis, defined as "sense of muscular effort" and measured by a 19-item test battery, and motor ability as measured by the Iowa General Motor Ability test. The intercorrelations between her test items were in general low, but more than half of them were positive. All of her statistically significant correlations were positive.

Purpose of the Study

There is reason to believe that kinesthesis is employed to a greater degree in wrestling than in most other sports activities, as for example swimming, tennis, football, or track. The implication should not be taken to mean that good kinesthetic sensitivity is the only requirement for successful wrestling. Kinesthesis, whether necessary or not, would take its place among the many other factors which go into making a good wrestler. Such factors as strength, speed, skill, endurance, strategy, and experience play important roles in any wrestling contest.

Wrestling, since one is working against an opponent, is basically an interplay of forces which are changing in amount and direction at an unpredictable rate. If any wrestler hopes to cope with this constantly changing situation, he must be able to adjust to these forces quickly and adequately. However, before he can make his adjustment he must "feel" or detect the forces to which he must adjust. In wrestling, these discriminations seem to be made primarily through kinesthetic cues coming from the muscles. There is probably help in maintaining bodily position through the sense of balance, involving the semicircular canals of the internal ear. Visual and auditory cues help also, but to a lesser degree.

Proof of championship ability without visual cues is furnished by the many blind wrestlers who have won wrestling tournaments. Boys from the California School for the Blind have won several championships in their wrestling league. Many coaches will blindfold a wrestler to teach him to rely on his kinesthetic cues, as they give muscle force information to a much more satisfactory degree.

These kinesthetic cues are important, both when the wrestler is applying the force and when the forces are applied upon him. His body position is affected by the forces, and through lack of the necessary cues or negligence, he may find himself at a disadvantage. If his weight is shifted too far, the opposing wrestler can feel this overshifted weight and apply the necessary maneuver to better his own position.

Unlike a swimmer, who is continually repeating one sequence of motion over and over again against a relatively constant force (water), the wrestler, when wrestling, works against an ever-changing situation involving relative body positions as well as forces. The holds he uses are largely governed by the immediate body positions and force situations. Unless the relative body positions and force situations are correct, a particular hold or counter-hold will not work effectively. Strategy, skill, speed and strength help to set up ideal situations. But unless the wrestler can discriminate between amounts and directions of forces as well as determine relative bodily positions through his kinesthetic cues and balance, the writer believes that, in all probability, this particular wrestler will not be successful.

Method and Procedure

Twenty-one subjects taken from the intermediate and advanced wrestling classes at the University of California were rated by two judges on their ability to handle themselves physically in wrestling situations. Emphasis was given to such things as ability to notice change of force, awareness of relative body positions, and over-all balance.

These ratings were made separately by each judge on an eight-point scale. An effort was made to exclude from consideration such factors as experience, speed, skill, strategy, and strength. The two judges, being wrestling coach and assistant at the University of California, had worked together with all of these men for a considerable period of time.

KINESTHETIC ACUITY

The apparatus has been described in a recent article by Henry (1). In the *constant* pressure test, the blindfolded S pressed horizontally with his hand against a pivoted lever, using a force of 20 pounds. The wood block he pressed against can be seen in the upper right-hand corner of Figure I. He was told to get the feel of this pressure, and then the apparatus started up and went through a one-minute cycle of irregular change in pressure which S was expected to follow by increasing or decreasing his applied force so that he was always pushing with his original 20-pound force.

The amount of failure to do this accurately was graphed on a moving paper chronograph tape by a differential analyzer. This device drew a straight line if S kept the pressure constant, while inaccuracies caused a proportional irregularity in the record. The length of the actual line was estimated with a map measurer, and constituted the score of S. It was noted that the average of the three poorest scores was twice as large as the average of the three best scores.

The *constant position* test used the same apparatus, but without the differential analyzer. S began the test as before, but endeavored to prevent any change in position of the lever by changing the force he applied to it, thus countering the irregular force created by the machine. One cycle of operation lasted one minute, and a straight-line graph on the chronograph tape was a perfect score.

Because the inaccuracies of adjustment were very small, the length of the line did not prove to be an adequate method of scoring. Instead, the sum of the largest deviations from the "drift" line at each of ten points of greatest pressure change produced by the machine was used as the constant position score. This technique will be understood by referring to Henry's Figure 3 (1). There was good differentiation between scores, as the average of the three poorest was three times larger than the average of the three best.

BALANCE

Ability to maintain balance, with the eyes blindfolded, was measured with S in the position of a normal wrestling crouch on the hands and knees

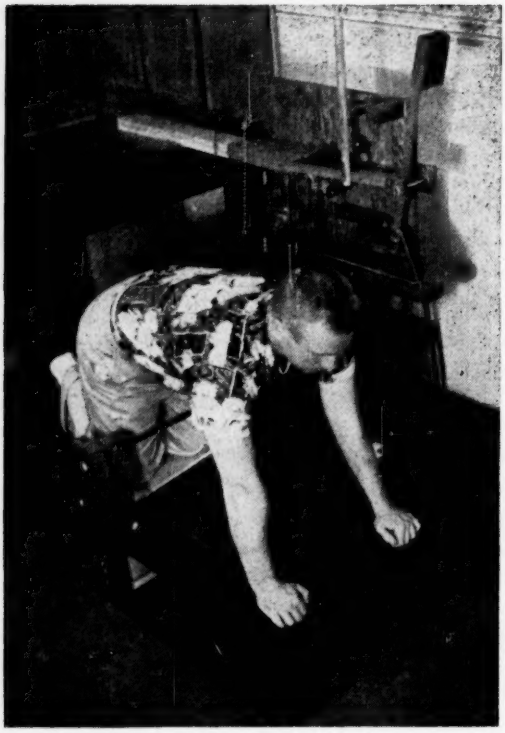

FIG. I. Stabilometer, with Kinesthesis Apparatus in Background.

(referee's position) as shown in Figure I. The stabilometer used for this test had the center of rotation (pivot) placed ten inches above the platform on which S was crouched. Preliminary experiments had shown that the usual type of balance platform was too unstable, and none of the Ss could achieve any degree of balance. Even with the altered pivot position, the best S was unable to maintain balance for more than a few moments at a time.

The balance score was the length of the line graphed on the chronograph, as drawn by a pen connected to the stabilometer platform. There was a good differentiation of scores, since the poorest three Ss averaged 4.5 times as large a score as the best three. Each trial was one minute in length.

SKIN PRESSURE ACUITY

A blood pressure cuff was wrapped firmly around the upper arm of S. Pressure was applied by an inflation device made from a section of automobile inner tube used as an air container. It was squeezed between two wooden plates hinged together at the back, operated by a lever that could be clamped in any desired position. A small section of one of the plates had a

separate lever and hinge to provide for vernier adjustment. Pressure was measured with a water manometer, using a short length of capillary tubing in the air line to damp out oscillations during adjustment. Using this device, the desired pressure could be quickly and silently applied to the arm by operation of the main lever, and this pressure could be increased or decreasd in small amounts with the vernier lever.

Two pressure levels were used, namely 25 and 50 cm. of water. At each pressure level, ten discrimination tests were made consisting of five increases and five decreases presented in irregular order. The manometer was read at the instant S reported perceiving an increase or decrease. The rate of pressure change was held as close as possible to one centimeter per second. There was considerable differentiation between Ss, as the average score of the three poorest was five times larger than the average of the three best.

ORDER OF TESTING; RELIABILITY

In Table 1, the time schedule for the testing is shown. The particular order used represents an attempt to avoid undue fatigue of the muscles involved. The reliability of the different tests has not yet been established and cannot be studied very satisfactorily in the present experiment because the number of Ss is very small and they represent a highly selected group. Henry (personal communication) has furnished tentative figures for the reliability of the constant pressure test as $r = 0.91$, of the constant position test as $r = 0.82$, and for the balance test, $r = 0.75$.

TABLE 1

Order of Testing

Apparatus	Test		Time (*Minutes*)
Kinesthesis Apparatus	constant pressure	(#1)	.00 - .05
Kinesthesis Apparatus	repeat	(#2)	.06 - .10
Stabilometer	balance	(#1)	.11 - .15
Stabilometer	repeat	(#2)	.16 - .20
Kinesthesis Apparatus	constant pressure	(#3)	.21 - .25
Stabilometer	balance	(#3)	.26 - .30
Stabilometer	repeat	(#4)	.31 - .35
Kinesthesis Apparatus	constant position	(#1)	.36 - .40
Kinesthesis Apparatus	repeat	(#2)	.41 - .45
Skin Pressure	perception of pressure change	(#1)	.46 - .55

Experimental Results

PRELIMINARY STATISTICAL ANALYSIS

The combined ratings of the two judges have been used to separate the wrestlers into two groups of approximately equal size. One group (G) contains the better half of the wrestlers and the other group (P) contains the poorer half. Calculations have been made for the statistical significance of differences between these two groups using the *t*-ratio. The results are shown in Table 2. Since the hypothesis being tested specifies the direction of the

expected differences between the groups, a single-tailed t distribution is used, requiring a t of 1.72 for the 5-per-cent level of confidence and 2.46 for the 1-per-cent level.

The results show no indication of significant differences between the two groups in the test concerned with constant position ($t = 0.26$). No statistical analysis has been made for the skin pressure test because the scores of the two group of subjects are nearly identical. The good wrestlers, in the 50 cm. test, discriminate pressure changes of 4.1 cm. compared with 4.3 cm. for the poor group. In the 25 cm. test the good and poor wrestler groups both discriminate 2.7 cm. of pressure.

TABLE 2

Comparison of Good and Poor Wrestlers

(Length of line in inches. A perfect score would have a length of 8.5.)

Comparison	Constant pressure all 3 trials	Constant pressure trials 2, 3	Balance trials 3 and 4	Balance learning trial 1 minus 4
Mean (G)	14.2	13.9	58.9	73.0
Mean (P)	16.7	17.2	71.2	54.2
t ratio	2.15	3.06	1.73	1.91

Significant differences appear between the G and P groups in the constant pressure kinesthesis test using the average of trials 2 and 3 ($t = 3.06$). The difference is less significant when the average of three trials is used ($t = 2.15$).

Since there is evidence of considerable learning in the balance test (see Figure II), one of the statistical analyses uses the average of trials 3 and 4, which are in the plateau region. In this case, the t ratio between the groups

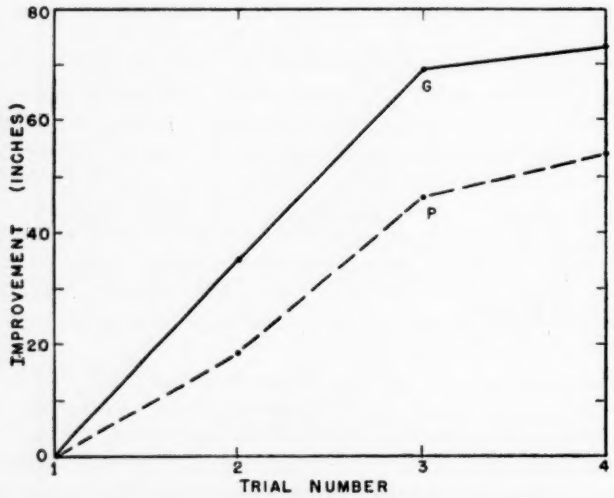

FIG. II. Group Learning Curves for Balance Test.

is 1.73. The other analysis uses a learning score consisting of the difference between trial 1 and trial 4, and gives a t ratio of 1.91. Both of these are statistically significant. Mean scores for the tests that differentiate the two groups are given in Table 2.

CORRELATION ANALYSIS

Those tests which differentiate the groups in the preliminary analysis have been subjected to correlation analysis in order to discover the relation between individual differences in wrestling ability and proprioceptive sensitivity (including both kinesthetic and semicircular canal senses).

The r between the ratings of the combined judges and combined constant pressure trials 2 and 3 is 0.644. Using all three trials, $r = 0.647$. The test-retest reliability estimated by the correlation between trials 2 and 3 is $r = 0.821$. The reliability for the average of 2 trials, using the Spearman-Brown correction, is therefore 0.903. The correlation between the ratings of the two judges is $r = 0.824$, and with the Spearman-Brown correction, the reliability of the combined ratings of the two judges is 0.904. Using these two figures for the reliabilities, the correlation of $r = 0.644$ betwen the test and the ratings becomes $r = 0.713$ when corrected for attenuation in both test and rating.

"Balance" and "balance learning" show differentiating power by the t ratio analysis. However, the correlations of these tests with the judges' ratings are not significant, being only $r = 0.239$ and 0.245 respectively.

Since the constant position and skin pressure tests are non-discriminating, they have not been subjected to correlation analysis.

Discussion

Both the preliminary statistics and the correlation analysis show a significant and interesting relationship between wrestling ability and ability to maintain a constant pressure against a moving object in a dynamic situation. Henry (1) has shown that ability to discriminate in this situation is relatively poor and is a matter of perception, while ability to maintain a constant arm position under changing pressure can be done with a high degree of accuracy and seems to be a reflex type of response to the pressure change. Possibly, ability to adjust muscle tension reflexly in response to changing pressue is unimportant in wrestling. However, on the basis of extensive wrestling experience, the writer believes it is important and it was for that reason included in the test battery. It may be that the test in its present form does not adequately measure individual differences in this particular function.

Ability to balance in a wrestling posture seems to show promise as being important in wrestling. However, the test as used in the present experiment will have to be modified and improved in order for it to be very useful. It also seems likely that a better measurement of ability to learn balance may prove to be important. It can be expected that further experimentation in these directions will prove profitable.

Conclusions

1. Ability of an individual to maintain constant muscular pressure under a changing dynamic condition is significantly related to wrestling ability as subjectively rated by experienced wrestling instructors.

2. In balance, and in ability to learn to balance, good wrestlers are somewhat better than poor wrestlers. However, individual differences in these abilities are not correlated significantly with judges' ratings of wrestling in the present study.

3. Individual differences in wrestling ability are apparently unrelated to ability to maintain a constant arm position in a dynamic situation involvng changing applied force.

4. Ability to discriminate changes in pressure applied to the skin of the upper arm does not show any significant relation to individual differences in wrestling ability.

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(Submitted 9-23-52)

Critical Evaluation of Selected Physical Education Films

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THE VALUES OF discriminating use of films in education have been discussed and demonstrated in many reports of experiments and research studies. Most convincing were the training experiences of the Armed Forces in World War II (5, 10), as well as the survey of *Audio-Visual Education in City School Systems* (12), conducted by the Research Division of the National Education Association. The trend toward widespread postwar acceptance and utilization of educational films has been hailed and measured by Brooker (2), Gnaedinger (6), McPherson (9), and others.

Efforts to adapt and produce films for physical education purposes have been stimulated by such unique problems as the need for slow-motion analysis, for study of timing, for contrast between correct and incorrect form, and for the demonstration of many more skills than an individual instructor can usually master. There is also a growing tendency to consider the film as an integral part of physical education instruction, rather than merely a promotional or motivational device.

The marked increase in the number and type of physical education films has created difficulties of film selection for teachers. Teachers need accurate indications of the skill and school levels, and of the quality of films considered for classroom use.

Purpose of the Study

In view of the importance which the motion picture has assumed in the teaching of physical education, it becomes necessary for the teacher to have an annotated evaluated list of films. Therefore, this study[1] had three major purposes: first, to construct a rating scale for the evaluation of motion pictures for use in physical education; second, to obtain critical evaluation, by a panel of judges, of all the educational films previewed, utilizing the rating scale for the instructional films and subjective judgments for all the other educational films; third, to develop a catalogue of selected, annotated, and evaluated films intended for use in girls' and women's physical education classes.

For the purpose of this study, more than 500 films were previewed and classified as Instructional, Part-instructional and Motivational, General Interest, Entertainment, and Non-Available. Only those silent and sound 16mm.

[1]This is a report of selected parts of a doctoral dissertation in physical education completed at Indiana University in February 1952.

educational films which were produced during the period from 1930 to 1950 and which could be used in physical education with girls or women were annotated, evaluated, and included in the catalogue.

Procedure

The research design of this study involved the use of the panel procedure of film evaluation. By this procedure, it was intended to ascertain and appraise the objectives of the film, to judge whether the film fulfills those objectives, to estimate the film's educational potentialities, and to identify significant features of content and technical quality.

Twenty-four qualified judges were selected by the investigator to serve in panels of three or five judges each. They were drawn chiefiy from the faculties of the Physical Education Departments of Indiana and Maryland Universities.

A rating scale designed specifically for evaluating instructional physical education films was constructed. Many of the criteria used in the scale were adapted from the general standards for evaluating educational films, drawn largely from the professional literature. Other criteria which were more applicable to physical education films were formulated. The criteria were organized under four major headings (3, 4, 5, 7, 8). For the purpose of assigning a value to each criterion or item, numerical ratings of 1, 2, 3, and 4 were used to represent "poor," "fair," "good," and "excellent," respectively.

The choice of these four numerical ratings, rather than three or five, was prompted by the need to avoid an arbitrary mean rating or the "error of central tendency" (11, *p. 963*). Thus, the judges might be induced to make a more discriminating appraisal, and to assign a more selective value than the "average" for each trait considered.

A tentative rating scale was developed, and submitted to the doctoral committee for initial criticism. Among the more important suggestions was that the series of numerical values should be alternately reversed in order to avoid the "halo effect" error. Thus, the tendency to rate traits uniformly, without studying the listed criteria, would be reduced (11, *p. 963*).

The rating scale was repeatedly refined through pre-testing by the panels in pilot-training sessions, and through revising in accordance with the suggestions of the panel members, or the investigator's doctoral committee, and of co-operating audio-visual education authorities. As a result of these revisions and pre-testing, the number of items on the scale was reduced and a final copy of the "Evaluation Scale for Physical Education Films" was made. (See Appendix I, page 342.)

An effort was made to locate and secure films available for general distribution and relating to physical education for girls and women. The majority of the 142 sources contacted agreed to loan the requested films.

One rating scale per film was distributed to each panel member along with instructions. After the screening of each film, the panel members agreed on

the type of film seen. If the film was Instructional, it was rated by applying the scale. In applying the scale, the panel members collectively agreed upon the major purpose and the school and skill levels. Each panel member then independently rated the films.

If the film was one of the other three types (Part-Instructional, Motivational, or General Interest), it was rated subjectively without the use of the scale. For the latter three types of films, the panel members were requested to supply the school and skill levels, possible film use, and a composite rating. Each evaluator wrote comments. This information relating to the strong and weak points of each film was desired in order to establish some of the outstanding characteristics of an excellent film.

The rating scale was utilized by the panel members to evaluate 127 of the approximately 500 films. The other three types (111 films) were given subjective ratings through a consensus of the panel members. The remaining films were screened but not evaluated. The film preview sessions extended from February 1949 through August 1950.

ESTABLISHMENT OF THE RELIABILITY OF RATINGS

The statistical reliability of the judges' ratings were tested, after a six weeks' trial, by means of the formula for predicting the relation between the ratings of N judges and an infinite number of judges (13, *p.* 95).

Correlations ranging from .80 to .95 for ten films, selected at random, provided an indication of the reasonably satisfactory reliability of the ratings of the judges. A further check on the reliability of the rating scale was secured through the re-evaluation of six films by the same judges eight weeks after the original evaluation. In every case, the second application of the scale yielded the same composite ratings as the first application.

ESTABLISHMENT OF COMPOSITE RATINGS

A composite or qualitative rating was established for each of the 238 educational films evaluated. Separate ratings were computed for the Content and Technical Qualities of the Instructional films.

The numerical scores of 1, 2, 3 or 4, given to each item listed under Instructional Qualities were tallied for each rating scale. The total score for each of the three or five rating scales used for a given film were then combined. Similarly, the numerical scores given each item listed under Technical Qualities were tallied separately for the three or five scales and then combined. The combined scores for Instructional Qualities and Technical Qualities on a given film were divided by the number of judges on the panel in order to determine the two separate average scores. The average score for each category was then divided by the number of rating scale items for that category. The final average score for each of the two categories was then translated into one of the four composite ratings of excellent, good, fair, or poor. The other types of films also received composite or qualitative ratings of excellent, good, fair, or poor.

DEVELOPMENT OF CATALOGUE

The compiled data for the 238 films were organized into a catalogue of annotated, evaluated physical education films. Each film review in the catalogue is divided into three sections. (See sample review, Appendix II, page 344.) In addition to the 238 film reviews, the catalogue consists of a section on instruction for its use; an alphabetical listing of subject headings; and a subject classification and grade level index.[2]

Discussion of Data

The statistical data obtained in the process of film evaluation were organized into five tables and six figures. The compiled data reveal the number and types of films suitable for each subject heading; the number and types of films suitable for each school and skill level; and the number and types of films which received composite ratings of excellent, good, fair, or poor. Owing to space limitations, only Table 5 is included in this report.

Ratings of the educational films according to subject headings and skill levels grouped the films under 44 subject headings and one combined skill level. (See Appendix III, page 344.) The largest number, 23 films, is listed under Modern dancing. Folk and national dancing rank second with 20 films, followed by skiing with 18 films, tennis with 15, and golf with 14 films. Twelve subject headings are represented by only one film each. No effort was made to obtain all the ballet films since ballet is seldom included in the modern physical education curriculum.

Although the original skill levels were "beginner," "intermediate," and "advanced," it was necessary to combine two of the levels and add one overall level since many of the films were judged to be suitable for more than one skill level. The "beginner-intermediate," "intermediate-advanced," and "all" categories were added.

Qualitative ratings of the content of the 127 instructional films were then classified according to the 44 subject headings and five skill levels, plus one combined skill level. Baseball and track-athletics, with ten films each, have the largest number of instructional films. Tennis and life-saving rank second with nine films each; and swimming and accident-prevention rank third with seven films each. No instructional films were listed for badminton and rhythm; and only one instructional film each for bowling, soccer, folk and national dancing, social dancing, speedball, soccer and square dancing. Next, qualitative ratings of the 238 educational films and 127 instructional films, respectively, were classified according to 44 subject headings and ten school levels, plus one combined level (excluding primary).

The panel members were originally asked to select or check one of the following school levels for which the film was best suited: primary, elementary, junior high, senior high, college, and adult. However, all of the 238

[2]The catalogue is not yet available to the public.

evaluated films were judged to be useful for more than one level. Therefore, it was necessary to group two or more school levels together in order to formulate as many school level categories as had been indicated by the judges. The panel members also added "teacher training" to the original list.

When the educational films listed in the various categories were totaled for each school level, 94 of the 238 educational films were found to be usable for the junior high school level, 199 for the senior high, 214 for college, and 194 for the adult level. Over half of the instructional films are found in the senior high, college and adult categories.

In summary, 48 of the 60 educational films which were rated excellent are instructional. About half (or 72) of the 145 educational films which were rated good are instructional; and six of the 30 educational films rated fair are instructional. Of the total number of educational films, 25.2 per cent are rated excellent, 60.8 per cent good, 12.6 per cent fair, and 1.3 per cent poor. Of the total number of instructional films, 37.8 per cent are rated excellent, 56.7 per cent good, 4.7 per cent fair, 0.8 per cent poor.

Table 5[3] is a scatter-diagram which presents data showing the comparison of the ratings as to Content and Technical Qualities of 127 instructional films. This table was devised in order to avoid duplicating much of the data already

TABLE 5

A Comparison of Content and Technical Quality Ratings of Instructional Films

Technical qualities	Content			
	Poor	Fair	Good	Excellent
Excellent			• • • • •	• •
Good		• • •	• •	• •
Fair	•	• • •	• • • • • • • • • •	•
Poor				

[3]The first four tables do not appear here, but are summarized in the above Discussion of Data.

presented in the tables on Content ratings. The great majority of the films received identical ratings for Content and Technical Qualities.

A list of characteristics of an excellent physical education film was formulated from the comments of panel members as to the strengths and weaknesses of the films evaluated:

1. The content of an excellent film is appropriate for the needs, interests, and maturity level of the particular school audience for which it is designed.
2. The major purpose of the film is indicated explicitly in the introduction of the film and gives direction to its development.
3. The content of the film is authentic and in keeping with modern concepts.
4. The film does not try to cover too much subject matter in the allotted running time.
5. The film is paced in accordance with the learning needs of the audience.
6. The film has adequate picture coverage and is not overloaded with narration.
7. The techniques or skills of an activity are well analyzed in a film intended for instruction.
8. The film has adequate slow-motion and stop-motion shots.
9. Close-ups are employed when there is a need for analysis; and medium or long shots are used when it is necessary to show total action or relationship.
10. The content is vividly presented and adequately repeated.
11. The film's interest-stimulating devices are subordinated to the lesson taught by the film.
12. The film is free of bias.
13. The sound is clear and synchronized with the pictorial presentation.

Summary and Conclusions

A fairly reliable rating scale for evaluating physical education films was constructed. The scale was devised in the light of the accepted principles of rating scale construction. A four-point numerical rating system was utilized in order to avoid the "error of central tendency." The process of refining the scale involved pre-testing the instrument and revising it in the light of the results. The suggestions of physical education and audio-visual authorities were also utilized in an effort to validate the scale.

The approved rating scale was utilized by 24 qualified judges to evaluate the 127 instructional films. The other 111 of the 238 educational films included in the study were given subjective ratings through a consensus of the panel members.

A composite or qualitative rating, based upon the judgment of the panel members, was established for each of the 238 educational films evaluated. Separate ratings were computed for the Content and Technical Qualities of the instructional films. The other educational films were given over-all ratings.

As a result of the data gathered from the film companies and the judges' evaluations, a catalogue of annotated, evaluated physical education films were developed. Also, from the evaluative phase of the study a proposed list of characteristics of an excellent physical education film was established. These characteristics were derived from the judges' comments on the strengths and weaknesses of each film.

Among the specific findings of the study is the indication that educational films which utilize slow-motion photography are generally superior to those which do not employ this technique. Of the 238 educational films, it appears that those considered instructional are superior in content and technical qualities to the other types.

The greatest proportion of the instructional films was found for the "beginner-intermediate" skill level, and the "senior high, college, and adult" school levels. The subjects with the greatest proportion of instructional films, are baseball and track-athletics. Lifesaving, tennis, swimming, and accident prevention are also represented by a relatively large number of instructional films.

It is evident that additional instructional films, designed specifically for the primary and elementary levels, are needed. Films are especially needed in the areas of rhythm and dancing for these two levels. More instructional films are also needed for archery, badminton, basketball, bowling, camping, folk and national dancing, square dancing, hockey, rhythm, soccer, speedball and volleyball.

The greatest proportion of instructional films rated excellent is found in the "all" skill level category; the "primary and elementary" school levels; and the activities of baseball, track-athletics and acrobatics. Of the instructional films dealing with archery, basketball, bowling, folk and national dancing, modern dancing, golf, horsemanship, life-saving, softball, speedball, and tennis none are rated excellent. Therefore, it would seem that films of higher caliber should be produced for these widely taught activities.

There is apparently an inadequate supply of films designed for administrative or teacher-training purposes and also for mass activities and games introductory to major sports.

The conclusions of the study indicate that additional films of superior content and technical qualities are needed to facilitate instruction of many activities on the various skill and school levels.

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APPENDIX I

Evaluation Scale for Physical Education Films

Instructions

The items listed in this score card have been selected from the detailed standards and condensed for the purpose of facilitating the evaluation of films. Read the accompanying standards carefully. Study the score card items and associate them with the standards on which they are based. The criteria and standards should be thoroughly understood before the film is reviewed. Record the ratings on the score card by directions given.

A film may be rated excellent for one purpose, and only fair for another. Therefore, in judging a film, the evaluator should keep in mind the main purpose for which the film is to be used. Fill in the major purpose before evaluating the film.

Check twice the specific school level for which the film is *best* suited. Evaluate the film in terms of that particular school level only. Check once other levels for which the film may be used. Check twice the sex for which the film is *best* suited. Check the skill level.

The films should be scored as follows:

4—Excellent
3—Good
2—Fair
1—Poor

For the check list, encircle the appropriate number in front of each item. Do not total the scores.

Film Title: _____ Educational Author: _____
Producer: _____ Date: _____
Sound: _____ Silent: _____ B&W: _____ Color: _____ Reel(s) _____
Sale Price: _____ Minutes: _____
Brief Comments on Content: _____
_____
_____
_____
_____

Evaluation Scale

Name of Evaluator ..... Date .....

Film Title: .....

Major Teaching Purpose of Film: .....

School Level: Pri. ....., Elem. ....., Jr.H. ....., Sr.H. ....., Col. ....., Adult .....

Skill Level: Beginners ....., Intermediate ....., Advanced .....

Sex: Male ....., Female ....., Both .....

(Encircle the appropriate number)

I. Instructional Qualities

..... A. Objectives

1 2 3 4 1. The objectives are clear, definite and easily identifiable.

4 3 2 1 2. The objectives are met by the content and methodology.

1 2 3 4 3. The length of the film is suitable for attaining the objectives.

4 3 2 1 4. The objectives are in harmony with the goals of the current physical education curriculum.

1 2 3 4 5. The objectives are met by the film as a medium of communication.

..... B. Film Content

4 3 2 1 1. The content of the film is up to date.

1 2 3 4 2. The content is accurate and true.

4 3 2 1 3. The content is unbiased. (as to method, emphasis, producer)

1 2 3 4 4. The content of the film is sufficiently complete so as not to be misleading.

4 3 2 1 5. The content appeals to the students' interests at the intended school level.

1 2 3 4 6. The level of difficulty, the scope, and pedagogy are suitable for the maturity and skill level of the students.

4 3 2 1 7. The setting and characters are in keeping with the principles of physical education. (Instructor, scenes, et cetera, should be suitable for school use and sex intended.)

1 2 3 4 8. The motor skills presented and or techniques are well analyzed.

4 3 2 1 9. The narrative comment is effective and helpful. (not overloaded or underloaded with narration)

1 2 3 4 10. The commentary complements the pictorial medium.

4 3 2 1 11. Irrelevant distraction, objectionable and unimportant materials are excluded. (any scenes with no teaching value)

..... C. Organization and Development of Film Content

1 2 3 4 1. The introduction stimulates interest.

4 3 2 1 2. The content is in the best order for learning.

1 2 3 4 3. The tempo or pacing of the film is developed so that the students can understand the content.

4 3 2 1 4. The student's attention is directed to the important points in the film.

II. Technical Qualities

..... A. Photography, Sound and Lighting

1 2 3 4 1. The film is steady.

4 3 2 1 2. The pictures are sharp, clear, and free from blemishes.

1 2 3 4 3. The color of the picture is suitable for the content. (color adds or detracts)

4 3 2 1 4. The film is free from extraneous recorded noises.

1 2 3 4 5. The sound is clear, undistorted, and easily understandable. (Music, narrator's voice, or other)

4 3 2 1 6. There is neither disturbance nor lack of understanding due to improper synchronization.

1 2 3 4 7. The film is free from over-exposure that may cause eyestrain.

4 3 2 1 8. The lighting is adequate and evenly distributed. (regular or uniform)

APPENDIX II

Sample Film Review

TACTICS IN OFFENSE AND DEFENSE
FILM DATA: si c 1 rl 14 min. DATE: 1946
LOAN SOURCE: USFHA LOAN ONLY
TYPE: Instructional SCHOOL LEVEL: hs, col
SEX: Female SKILL LEVEL: int, adv
PURPOSE: To demonstrate some defensive and offensive plays in hockey
DESCRIPTION: Presents field hockey tactics for defensive and offensive plays. Each strategic play is preceded by a diagrammatic explanation through the use of animated photography. The plays include shifting defense, circular tackle, corner and triangle passes.
APPRAISAL: Content: *Good.* Technical qualities: *Fairly Good.*

Shows good team plays; more close-up and medium shots are needed to make a better teaching film. The field markings are not clear and the teams can hardly be distinguished from each other. The use of diagrams and animated photography enhance its teaching value.
SUBJECT HEADING: Field hockey

Abbreviations: si—silent; c—color; rl—reel; USFHA—United States Field Hockey Association.

APPENDIX III

Subject Headings

Accidents—Prevention
Acrobats and acrobatism
Archery
Badminton
Baseball
Basketball
Boats and boating
Bowling
Camping
Dancing
Dancing—Ballet
Dancing—Folk and national
Dancing—Modern
Dancing—Social
Dancing—Square
Diving
Exercise
Fencing
Golf
Hockey
Horsemanship
Lifesaving
Massage
Mountaineering
Orienteering
Physical testing
Physiology
Play
Posture
Recreation
Rhythm
Rifle practice
Sailing
Skating
Skis and ski-running
Soccer
Softball
Speedball
Sports
Sportsmanship
Swimming
Tennis
Track athletics
Volleyball

(Submitted 5-29-52)

Methods of Evaluating Student Teaching in Physical Education

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THE MATTER OF evaluating the experiences of student teachers, as they function in an active classroom has been a very difficult one ever since the development of this phase of teacher education. The responsibility for such evaluation varies with different teacher-education institutions.

In the past decade there has been increasing concern over such questions as: "Who is responsible for the evaluation of the laboratory experience of students?", "What devices should be used in this evaluation?", and "What are the characteristics of a good student?" These and many other questions have been raised in the search for the solution to this growing problem.

Such specialized fields of study as art, industrial arts, commercial subjects, and physical education present unique problems which are not always dealt with satisfactorily by the established methods of evaluation. For instance, many of the rating forms in use are so constructed that they can be applied only to a classroom recitation. This is especially true in the field of physical education, with which this study deals.

Physical education is a multi-objective field of study, and for this reason the matter of evaluation of student teaching is more complex here than it is in many of the other subject areas. Physical education contributes to the student physically, psychologically, and socially, and measurement of the student teacher's impact upon his students must take into account these many ramifications. The student teacher's contribution to changes in the total behavior of a student must be weighed, as well as his contribution to improvement in the student's playing skill.

The purposes of the study were: (1) to examine the practices of evaluating student teachers in physical education; (2) to determine what sound practices should be; and (3) to submit to the profession some suggested policies to serve as the basis of a functional plan for the evaluation of student teaching in physical education.

Procedure

An extensive review of literature was made in order to isolate the various aspects of the problem under consideration. This review of the literature served as an aid in the construction of a questionnaire to enable the author to gather his information on a national scale.

The questionnaire was in two parts. The first part was designed to determine current practices in the evaluation of student teaching in physical educa-

tion. The second part was designed to give the respondents opportunity to describe what they believe are "ideal" practices. These respondents were persons actively engaged in student-teaching activities.

The questionnaire was first sent to the teacher-training institutions in Ohio. The answers were carefully examined, and the questionnaire was then revised on the basis of the results. The revised questionnaire was sent to 320 teacher-education institutions which offer either a major or a minor in physical education.

There were 191 replies received, of which 183, or approximately 57 per cent of the total number of questionnaires sent out, were usable. Replies were returned from each of the 48 states. They represented small, medium-sized, and large institutions, and both privately endowed and state-supported institutions.

The results of both parts of the questionnaires were studied and analyzed. The findings were then compiled, on the basis of the results of the questionnaire and the review of literature, which included some previous studies.

The entire study was reviewed again for the purpose of finding a tentative list of criteria for a functional plan for evaluation of student teaching in physical education. This list of 13 criteria was then sent to a jury of qualified educators, who rated the various points. On the basis of the jury's rating, a final list of eight criteria was determined.

The criteria were utilized in the selection of suggested policies for a functional plan of evaluation. These suggested policies were then evaluated by trial in actual situations in selected institutions. The suggested policies have been revised on the basis of this final trial and evaluation.

Summary of Findings

In this study, various aspects of the evaluation of student teaching in physical education were examined, and the following findings were made:

1. Student teachers are placed in a variety of situations for laboratory experiences. Public schools were utilized by 175 institutions, laboratory schools by 51, parochial by 24, private schools by 17, and university classes by 34. In recommending desirable practices, respondents favored less use of university classes. This recommendation is similar to that found in other recent studies.

Several respondents recommended a combination of experiences, in order that the student might benefit from the experiments and demonstrations conducted in the university schools and might still have opportunity to teach in the public schools with their cross-section of students and with the problems that arise in public school situations.

2. Teacher-education institutions reported the following arrangements made with the supervising teacher: (a) A monetary remuneration is paid by 104 of the reporting institutions; (b) Fifty-nine of the institutions considered the supervising teacher as a member of the faculty; (c) Thirty institutions offered special privileges, such as free tuition, to the supervising teacher; (d)

Twenty-six institutions made arrangements for granting some credit toward teaching load, for performing supervisory service. Nineteen of the institutions made no attempt at remuneration of any sort.

Respondents expressed a wish to have more attention given to reduction of the teaching load of the supervising teacher. Both the Subcommittee of the Standards and Surveys Committee of the American Association of Teachers Colleges and the National Commission on Teacher Education and Professional Standards advocate an adjustment in teacher load.

3. The teacher-education institutions attempted to inform the supervising teacher of his functions in a variety of ways. One hundred and six institutions instructed either the supervisor of physical education or the director of student teachers to review the student teaching experiences with the supervising teacher, in either individual or small-group conferences. Seventy-four institutions conducted meetings for all supervising teachers, periodically. Twenty institutions made no attempt to perform this function.

Other institutions reported the following miscellaneous devices for meeting the issue: (a) mimeographed material sent to all supervising teachers; (b) workshops; (c) informal teas and parties; (d) comprehensive booklets; (e) participation by the co-operating superintendent; (f) courses offered in summer school (g) courses offered in summer conferences; (h) seminar courses with credit; (i) extension courses; and (j) provision for teachers to work on advanced degrees.

4. The college of education (or the department of education) is the unit most often made responsible for the program of student teaching. This unit was reported by 124 institutions as being either the sole responsible unit or as sharing a co-operative responsibility. The department of physical education was similarly reported by 109 institutions, and a special division of student teaching, by 37.

One hundred and thirty-two respondents expressed the opinion that the department of physical education should enter into evaluation more frequently, and that the supervisory unit should be a co-operative one. This last recommendation is in agreement with recommendations of the Subcommittee on Standards and Surveys of the American Association of Teachers Colleges.

5. The number of credit hours awarded for student teaching is heavily influenced by the certification requirements in the states in which the institutions are located. There is very little conformity in state certification requirements. They are usually stated in terms of a minimum number of credit hours. Only one state (Washington) lists the maximum number of hours which may be allowed.

6. Institutions reported practices varying from giving no credit for student teaching to granting 15 semester hours' credit. The respondents favored an adjustable number of credit hours, in order to meet the differing needs of individual students.

7. The number of hours per week spent in student teaching varied greatly, and it corresponded to the number of credit hours given for student teaching. At the present time, 47 (or 25.1%) of the institutions use the internship, or block, type of student teaching. Respondents recommended this type of teaching in 82 (or 44.9%) of the replies.

8. The specific grade (such as A, B, C, etc.) was used by 171 of the replying institutions, either alone or in conjunction with some other type of evaluation. Of these, 77 used the specific grade as the only device for rating student teachers. The written evaluation was reported by 87 institutions, but only six used the device alone. Only 120 respondents recommended giving a specific grade, while 131 favored the written evaluation.

9. The average grade for all reporting institutions was approximately "B." Several institutions reported a grade average of "A." Reasons were submitted to justify the high average. Remarking upon the desirability of awarding specific grades in student teaching, respondents favored it, in 136 instances. Thirty-six respondents expressed the opinion that grades should not be given. Arguments for both practices were cited.

10. One hundred and thirty-six institutions had a definition of good teaching or a statement of the characteristics of the good teacher in writing while 47 institutions had no such statement available. Respondents in 176 instances expressed the opinion that such a statement would be desirable. Only six did not see a need for such a statement. The California Council on Teacher Education has formulated such a statement, which should bear further study.

11. Diagnostic tests were reported as given prior to, or during, student teaching, by 86 (or 46.9%) of the reporting institutions. Ninety-five (or 51.9%) did not give any such tests. One hundred and sixty respondents expressed the desirability of using such tests.

12. Prerequisites to student teaching were numerous and varied. One hundred and fifty institutions required a period of observation prior to student teaching. (This period varied from one week to one semester in duration.) Other prerequisites listed were a minimum scholastic average, minimum average in the major field, a departmental recommendation, medical examination, and a faculty committee recommendation. The respondents recommended, in 149 cases, that a period of observation should be required.

13. The supervising teacher was responsible for evaluation of student teachers more frequently than was any other person. This was true in 160 of the reporting institutions. In 40 of them, the supervising teacher performed this function alone.

14. The evaluation of student teaching was a co-operative activity in 104 institutions, and in 76 it was performed by one person only.

15. Evaluation, for record, was performed at the end of the student teaching period in 179 institutions, 13 of which reported continuous evaluation. In 64 institutions, evaluation was done only at the end of the teaching period.

16. Student teachers in physical education, in most cases, were offered a variety of experiences. Conducting general service classes, giving classroom instruction, assisting in intramurals, and assisting in coaching were ranked, in that frequency order, as prevailing types of experience.

17. A variety of data-gathering devices were reported by the institutions surveyed in this study. The informal conference was the type most often used. This medium was used in 134 institutions, and in 23 of these it was the only device used. The rating scale was used in 127 institutions, of which 17 reported it as the only medium used. These two media were followed, in frequency of use, by seminars, anecdotal reports, and student teacher's log. Few respondents recommended the use of any single medium, and it was recommended that all media be used more frequently than was being done.

18. Numerous uses were made of the evaluation results. Use as a basis of the academic grade was reported by 167 institutions, of which 17 listed this as the only use. It was followed in order by use as basis of recommendation for placement; as an aid in counseling student teachers; as information for the hiring superintendent; as a means of judging strength and weaknesses in the teacher-education program; and as motivation for self-evaluation by the student teacher.

19. Twenty-six respondents reported complete satisfaction with the current evaluation program; 26 reported dissatisfaction with parts of the programs. Thus, 85.8 per cent reported either total or partial dissatisfaction with the program of evaluation in use for student teaching.

20. The respondents listed a series of problems which confronted the persons responsible for student teaching. Problems most frequently reported were: need for better rating scales; lack of consistency in rating by the supervising teacher; lack of objective rating; and lack of sufficient time for observation, evaluation, and counseling.

Selection of Criteria

The final criteria, as mentioned above under Procedure, are listed in rank order of importance as selected by the jury members:

1. The evaluation plan must be consistent in spirit and action with the objectives of education and the learning process.

2. The plan of evaluation should be a guidance process which is consistent with democratic human values and the nature of an effective learning situation.

3. The plan of evaluation, as an integral part of the learning process, should be a continuous process to be developed co-operatively by all persons.

4. The plan should take into consideration the individual situation in which the institution operates.

5. The plan of evaluation should be such that it may be carried on in a variety of teaching-learning activities in which teaching competence is observable.

6. The plan must be significant in the light of the end to be served: better evaluation of student teachers in physical education.

7. A plan should have many of the growth values sought, which cannot be rated but which are best evaluated through critical analysis of descriptive evidence of specific behavior.

8. The plan of evaluation should give the student opportunity to take an active part in recording and evaluating his growth and development.

Suggested Policies

With the criteria listed above as a guide, a set of suggested policies for evaluation of student teaching in physical education were formulated:

1. Responsibility for the supervision of the program of student teaching is a co-operative one, and this responsibility is shared with the major department (which in this case is the department of physical education).

2. The actual evaluation of student teaching in physical education is a co-operative one, and a representative from the department of physical education should be involved. The delegation of this responsibility to only one person is deemed undesirable.

3. Wherever it is feasible, the reduction of the teaching load should be a consideration in the arrangement between the supervising teacher and the teacher-education institution.

4. The teacher-education institution should assume the responsibility of informing the supervising teacher of his function.

5. Each teacher-education institution should formulate its own statement of teaching competence, to be utilized for the evaluation, self-evaluation, and counseling of student teachers.

6. Each teacher-training institution should develop a rating scale to fit its own situation. This rating scale should be constructed in harmony with the institution's statement of teaching competence, and should be of such a nature as to be interpreted easily for student teaching in special subject fields (in this instance, physical education).

7. Where it is administratively feasible, the use of a specific grade for student teaching should be discontinued. If this is not possible, then the specific grade should be used in combination with some other means of evaluation, such as the anecdotal report.

8. More than one type of rating should be utilized in the evaluation of student teaching in physical education. Rating scales, anecdotal reports, student teachers' logs, seminars, and conferences are media that may be used effectively.

9. The evaluation of student teaching in physical education should be a continuous process, and a formal evaluation should be made at several definite periods.

10. There should be an increase in the length of time devoted to student teaching in most institutions, and the internship or block plan should be used wherever its use is administratively feasible.

11. The academic credit and the required number of student-teaching assignments should be flexible, so as to meet the individual needs of the student and of the laboratory school.

12. The results of the evaluation of student teaching should be available to authorized and interested persons, for use in guidance and placement of the student teacher.

13. Institutions should make use of diagnostic tests, before and during student teaching, in order to discover the strength and weaknesses of prospective teachers.

Re-evaluation of Suggested Policies

The suggested policies found in the previous section were put into practice in four universities of the State of Ohio. These universities were Bowling Green State University, Kent State University, Miami State University, and Ohio University.

In general, the policies were found to be functional and practical. The trial was not conclusive in the cases of policies 2, 3, 4, and 13.

Additional trial and experimentation should be made in several areas, such as the block plan of teaching and the elimination of the specific grade for student teaching.

(Submitted 11-7-52)

Attitudes Toward Athletic Competition in Elementary Schools

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FOR SOME TIME educators and laymen alike have felt that a critical examination of intensive competition in school athletics has been indicated. Magazine and newspaper articles and editorials on athletic competition have been appearing with increasing frequency in our literature. There are as many differing opinions concerning this topic as there are speakers and writers in the field. One reason for this is the lack of accurate information available.

The responsibility for undesirable practices in athletic competition has been attributed to administrators, teachers, or parents—depending upon the affiliation of the critic. No one, however, has attempted to discover what these various groups think or feel about athletics by a systematic collection of facts.

The pattern of intensive competition developed originally in colleges and universities has been extended down through the high schools and more recently into elementary schools. Because of the investigator's interest in this program of athletic competition in the elementary grades, it was decided to confine this study of attitudes to this age level.

Purpose

The purpose of this study was to examine and compare the attitudes of three selected populations—parents, teachers, and administrators—toward intensive competition in team games at the elementary school level by the use of an attitude scale. It is assumed that these populations are those influencing the conduct of school athletics.

Definition of Terms

The phrase "intensive competition at the elementary school level" was defined, for this study, as a program which follows a regular schedule of games with other schools in the city or surrounding area and which culminate in championship play-offs.

The term "elementary school" was defined for this study as the fourth through the sixth grade.

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[1]This study was made in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Physical Education for Women, Graduate College, State University of Iowa.

The definition of "experience with competition" referred to the following descriptions:

(a) Participated as a player in intensive competition at the elementary school level
(b) Participated as a coach or official in intensive competition at the elementary school level
(c) Observed as a spectator intensive competition at the elementary school level
(d) Observed as a parent the effects of this type of competition on elementary school children

Related Research

Very little has been done in attitude measurement in the field of physical education. Much of the early work in the field made use of the questionnaire and/or checklist methods of qualitative measurement. A few investigators—Stalnaker (7), Moore (5), Carr (3), and Wear (8) have done attitude studies using techniques developed by Thurstone, Likert, and others in the field of scale construction.

McCue (4) developed a scale for evaluating attitude toward intensive competition in team games for high school boys and college men. She used a combination of the Thurstone and Likert methods of selecting items, with the response to each item indicated by the degree of approval or disapproval as in a conventional Likert procedure. The construction of the scale involved a definition of sub-parts of the general area and the preparation of statements appropriate to each sub-part and the weighting of item responses in terms of favorability expressed by the stem statement.

The scale was presented to a group of physical educators who marked the scale two different ways, one to indicate the degree of favorability or unfavorability expressed by the item statement (on a five-point scale) and the second to express the degree of their own personal acceptance or rejection of opinion expressed by the item statement (on a five-point scale).

No attitude studies were found which dealt directly with the problem of intensive competition at the elementary school level. On the other hand, the literature contains many statements and resolutions which indicate that leaders in the field of elementary physical education are opposed to intensive athletic competition for this age level (1, 2, 6).

Procedure

A revision of the McCue attitude scale was used in the measurement of attitudes for this study. The Pearson Product-Moment correlation coefficient computed between the first and second administration of the revised attitude scale was 0.90.

To select the population for use in this study a preliminary canvass was made of all superintendents of cities of 10,000 or more population in the nine states of the Central District of the American Association for Health, Physical Education, and Recreation. Thirty-five per cent of the superintendents canvassed were willing to be included in the study.

These superintendents were sent a package containing 50 attitude scales, 50 answer sheets, 50 electrographic pencils (for machine scoring of the scale) and were asked to distribute the scale in these approximate frequencies: parents, 18-20; teachers, 15-20; and school officials, 10-15. The distribution was to be by chance rather than by selection.

Of these 31 co-operating superintendents, 27 returned completed scales in time to be included in the study. A total of 1,099 cases were available for use in the analysis of data.

Analysis of Data

Percentages were computed from the raw scores of the data to indicate the proportions of individuals in the study who were favorable toward intensive competition at the elementary school level and those who were unfavorable toward this type of competition. All plus scores were considered as indicating favorability toward competition, while all minus scores represented unfavorable attitudes.

Table 1 indicates the attitudes toward competition expressed in percentages. It may be seen that parents are most favorable toward this type of competition, with teachers and administrators following in that order. The mean scores of the three groups verifies the observation of favorability indicated in Table 1. The mean score for the parents was +29, for teachers +18, and for administrators +12.

TABLE 1

Attitudes of the Three Populations

Population	Number	Per cent favorable	Per cent unfavorable	Score Range	Score Mean	S.D.
Parents	357	78%	22%	−67, +71	+29	34
Teachers	508	68%	32%	−73, +73	+18	32
Administrators	234	55%	45%	−61, +74	+12	36

The range reported for all three populations (−73, +74 out of a possible range of −79, +79) would indicate the wide variability of attitudes expressed. This measure shows more vividly than any other the extremely controversial nature of this problem of intensive competition in the elementary school.

An analysis of variance was computed for the purpose of determining the significance of the difference between the means of the three groups. The results ($F = 18.84$; $F_{01} = 4.62$) of this analysis indicate a statistically significant difference between the means of the three populations at the 1 per cent level of confidence.

A significance ratio (SR = 2.98) between the mean scores of the total group who had had experience and the total group who had not had experience with intensive competition was found to be statistically significant at the 0.28 per cent level of confidence. It seems to the writer that this higher

favorability expressed by persons with experience may be partially attributed to several factors: (1) the personal satisfaction gained as participants in interscholastic athletic programs, (2) the general cultural emphasis on the values resulting from athletic competition, (3) the pressures to develop winning teams at the high school level, (4) the great spectator interest in seeing youngsters perform, (5) parents' desire for their childrens' success in prestige events, and (6) a reflection of the youngsters' enthusiasm and intense interest in their athletic contests.

A significance ratio computed between the scores of men and women responding to this scale yielded a score ($SR = 3.55$) statistically significant at the 0.26 per cent level of confidence. The higher favorability of the men is to be expected because of the closer association of men with the coaching and administration of athletic programs. Another factor to consider is the influence of our culture on the differing attitudes of men and women. Men and boys are supposed to be more competitively and athletically inclined than are women. Then again, the policy of the women's groups in physical education has been opposed to intensive athletic competition for girls and women on the basis of critical evaluation of the outcomes of such programs.

In order to determine whether similar attitudes are affected by geographic location, an analysis of variance was computed between the means of the scores of the populations contacted for this study in Iowa, Missouri, and Minnesota. No statistically significant difference was found ($F = 1.02$; $F_{05} = 3.01$). Thus, as measured by this scale, favorability toward athletic competition is fairly widespread among the populations measured.

The question was raised as to whether there was a difference in attitude of the populations in a state with state supervision of physical education and a state in which there is no such program of supervision. Referring to the above analysis of variance, it is noted that there is no statistically significant difference between the means of the attitude scores of the populations in Iowa, with no state supervision, and in Minnesota, which does have state supervision of physical education.

A correlation coefficient, computed between the score of the administrator who distributed the attitude scales and the median scores collected in his city ($r = .606$) indicated some relationship between the two. This might indicate a bias in the distribution of the scales, or a spread of attitude from administrator to teachers and parents. It would appear that if the former existed the correlation coefficient would be considerably higher than was the case.

A correlation coefficient ($r = .502$) computed between the mean score of the supervisor of physical education and the median scores from his city was found to be statistically significant at the 5 per cent level of confidence. Since the supervisor did not distribute the papers, this relationship could not reflect a bias and would therefore seem to indicate a spread of attitude.

Four phases of the participant's development, as indicated by certain items on the scale, were selected for further study in order to determine whether populations differed in each of these part scores as in the total and whether there were any outcomes of competition toward which attitudes were particularly favorable or unfavorable. The four areas or phases of development as measured by the scale were personality development, human relations, skills development, and safety. It was found that all three populations showed less favorability toward the items in the safety area, that is, that safety outcomes were not obtained, while in the areas of skill development somewhat greater favorability toward outcomes was shown.

Analyses of variance were computed for all four part scores and the F was found to be statistically significant at the 5 per cent level of confidence ($F = 14.24$, personality development; $F = 18.08$, human relations; $F = 18.18$, skills development; $F = 5.07$, safety).

A t test was employed to determine specifically where the existing differences in means occurred. There was no statistically significant difference at the 5 per cent level between the means of the scores of the teachers and administrators in three of the four areas—personality development, human relations, and safety—while there was a statistically significant difference between the parents as a group and the teacher and administrator groups in all four areas. These differences were similar to the differences found in the total scores—that is, more parents indicated favorability in all areas followed by the teachers and last, the administrators. In all four areas the mean scores of each population had a plus value which indicated that outcomes were generally considered favorable in each phase.

Summary

A revision of the McCue attitude scale was used to determine the attitudes of three populations toward intensive athletic competition at the elementary school level. A total of 1,099 subjects from seven states within the Central District of the American Association for Health, Physical Education, and Recreation responded to the scale. Of these 1,099 respondents, 357 were parents, 508 classroom teachers, and 234 administrators, including special supervisors of physical education.

On analysis, the data yielded the following facts:

1. A majority of all three populations marking the scale tended to be favorable in attitude toward intensive competition at the elementary school level.

2. The wide range of scores indicated wide differences of opinion on this question. This difference is more apparent among teachers and administrators than among parents.

3. Statistically significant differences were found in the attitudes of parents, teachers, and administrators. The parents were most favorable toward intensive competition at the elementary school level and the administrators were the least favorable.

4. The men in this study indicated more favorable attitudes toward intensive competition than did the women.

5. Individuals in this study who have had experience with competition expressed greater favorability toward it than those with no experience.

6. There is some agreement between attitudes of administrators and parent-teacher groups in the same city.

7. No definite geographic differences in the distribution of attitudes were discovered in cities or in the states included in this study.

8. Attitudes of all respondents toward outcomes of intensive competition in the four areas of development showed greater favorability in the skill area and less favorability in the safety area. Administrators and teachers did not differ in their estimate of the outcomes in human relations and personality development, but parents considered outcomes in all areas much more favorably than did the other two populations.

Implications for Physical Education

It seems to the writer that there are certain implications for those concerned with the elementary school program in physical education.

It appears that the program of intensive athletic competition at the elementary school level has the acceptance, if not the wholehearted approval, of most of the parents and teachers and administrators in the schools included in this study. On the other hand, a minority in all three populations is opposed to intensive competition. The scores on the scale, although indicating favorability, do not necessarily indicate a high degree of favorability. A vigorous public relations and education program could conceivably bring forth encouraging results in changing or amending present attitudes.

However, unless such a program is undertaken, this trend of intensive athletic competition at the elementary school level seems likely to increase unless physical educators take immediate steps to educate the public to the values of a sound program of physical education and intramurals to take the place of interscholastic athletics for children.

Obviously, if we wish to teach the relationship between basic principles of emotional health and competition, we must teach these principles by direct instruction rather than relying upon their assimilation as concomitant learnings as has been the case in the past.

The use of attitude studies has been largely overlooked in the field of physical education. The importance of attitudes and their effect on the program cannot be overlooked. It is hoped that this study will become one of a series of attitude studies covering the total problem of athletic competition in our society, thus providing a collection of facts for use as a point of departure in the development of those attitudes which favor general educational objectives.

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APPENDIX

Attitude Scale

PLEASE READ CAREFULLY

Directions

In the last few years an increasing number of comments regarding the outcome of athletic programs in the elementary schools (grades 1-6) have been expressed by the public. Parents, administrators, and teachers are all interested in athletic competition. It seems to us very worthwhile to attempt to determine what people feel about the participation of young children in team sports involving intensive competition. Will you please assist us in achieving our objective by marking the printed statements as indicated by the accompanying instructions?

By "intensive competition" in team games for elementary school children, we mean those programs which follow a regular schedule with other schools in the city or surrounding area which culminate in championship play-offs.

We should like to have your personal reaction to each statement as it is presented. Do you agree or disagree with the statement? In going over these statements, it may be helpful for you to check each one in terms of your own children or any other children whom you know. Even if the children in your town have never participated in intensive competition, what do you think the effects would be? Indicate your *own* opinion of the statement by making a heavy mark between the dotted lines opposite the item number in the answer sheet. The numbers represent the following code:

Strongly Agree	*Agree*	*Neutral or Indifferent*	*Disagree*	*Strongly Disagree*
1	2	3	4	5

Use 3 only if you neither agree nor disagree with the statement. If you agree slightly with the item, cross out the 2; if you disagree slightly, cross out the 4.

Please go quickly through the items and respond to each item as you go along. Your first impression is best for this purpose and we should rather not have you turn back to make a second decision.

There is no correct or incorrect answer to this set of items. We should like simply your personal opinion. Remember, check each item as to whether you personally agree or disagree with the item in regard to intensive competition in team games.

Items on Intensive Competition in Team Games for Elementary School Children

1. This type of competition generally promotes community spirit.
2. Participation develops physical fitness in most individuals.
3. Participation gives most individuals self-assurance.
4. Winning and losing in this type of participation helps to prepare most individuals for the competition they meet in daily living.
5. Participation helps to train most individuals to face the problems of everyday living.
6. This type of participation enables most individuals to work off emotional tensions.
7. Participation in this type of competition often leads to acceptance of the fact that one must play "rough" if the opponents are rough.
8. This type of competition is an illustration of the tendency to force children into adult patterns of behavior without concern for their emotional or physical development.
9. Participation gives most individuals a high sense of self-respect.
10. Participation tends to put most individuals in a state of emotional upset for a long period of time.
11. Participation gives most individuals an appreciation for a job which is well done.
12. The experience of this type of participation develops many individuals as leaders.
13. Most participants learn to respect any individual who has skill, whether opponent or team-mate.
14. The excitement of the spectators is an emotional strain for many of the participants in this type of competition.
15. Most schools cannot afford the equipment and facilities necessary to make participation in this type of competition relatively safe for their players.
16. Participation gives most individuals mental relaxation after the pressure of a game is over.
17. After individuals have participated in this type of competition they are more likely to want to participate in sports for the rest of their lives.
18. Participation gives most individuals a sense of good sportmanship.
19. The skilled person needs this type of participation in order to stimulate him to develop his physical skill still further.
20. Participation in this type of competition helps to train most individuals to form realistic outlooks and aims.
21. Some coaches will take the chance of playing a child without knowing his health status.
22. This type of competition trains children to become better players for the high school interscholastic program.
23. Competition at the elementary school level gives the children a chance to specialize in one activity.
24. The ingenuity of most individuals is increased through competition.
25. Participation presents no greater danger of accidents than other phases of daily living.
26. Through participation most individuals gain in mental alertness.
27. Participation makes most people feel that they are accepted by society.

28. Most players have limited opportunity to show initiative in the game situation.
29. Participation in this type of competition gives most individuals an enjoyment of participating in activity.
30. Most participants are happier and better adjusted individuals than non-participants.
31. Participation gives most individuals the ability to be at ease before the public.
32. Participation helps most individuals acquire good manners which carry-over into phases of everyday living.
33. Participation helps most individuals to discover what is needed to improve their own physical skill.
34. Through participation many players learn to evade the rules of the game.
35. This type of competition seldom promotes any interest in all the rest of the school's program.
36. Participation trains most individuals to profit from criticism.
37. Most individuals are aided in strengthening their ethical code by participation.
38. Most spectators get some enjoyment from humiliating their opponents through overwhelming defeat.
39. Participation often leads to unnecessary injury.
40. Participants tend to value accomplishment only if it is recognized publicly with prizes and similar awards.
41. Participation teaches most individuals to work for what they get.
42. Participation teaches most individuals to win without boasting in public.
43. This type of participation usually trains one in good health habits.
44. The children do not have time for a varied physical education program when they have intensive competition in elementary school.
45. Participation gives many individuals a feeling of inferiority if beaten often.
46. Participation teaches most individuals how to behave in other social situations.
47. Many spectators of this type of competition express feelings of antagonism toward the opposing side.
48. Danger of injury is a serious drawback to this type of activity.
49. Participation teaches most individuals to respect the rights of others.
50. Participation teaches most individuals to carry through in face of hardships.
51. This type of competition generally results in spectator control of sports.
52. This type of competition promotes a desire for greater athletic skill in younger boys who admire the success of well-known players.
53. This type of competition teaches most participants how to build up their own good physical condition.
54. This type of competition is exploitation of children for the satisfaction of the adult audience.
55. This type of participation does little toward equipping a person with recreation skills for later life.
56. Participation places an undue amount of physical strain on many individuals.
57. Many children who have entered into this type of competition do not enjoy athletics unless they can play before a crowd.
58. Participation is an effective way to get acquainted with people from other communities.
59. This type of participation enables most individuals to develop reserve physical strength for emergencies.
60. Most participants in this type of activity receive some type of minor chronic injury which they sustain through later life.
61. This type of competition seldom helps to promote the whole program of physical education.
62. This type of participation trains most individuals to consider their opponents as their enemies.
63. Participation helps most individuals to set a goal and follow it.

64. Developing the skill and strength needed for this type of participation "burns" most individuals out physically before they get to college.
65. Participation teaches most individuals to get along with people in the game situation and in many other aspects of life.
66. Participation gives many individuals an exaggerated idea of the value of their skill.
67. Through participation most individuals learn to control their temper.
68. Most highly skilled individuals get more fun from this participation than from any other type of physical activity.
69. This type of participation stimulates most individuals to give their best possible performance.
70. Most people who reach the skill level necessary for this type of participation are not willing to participate in any other athletics in which they do not already excel.
71. Participation teaches most individuals to be modest.
72. Most participants improve their skill in getting acquainted with strangers.
73. To develop the great degree of athletic skill required by such competition takes more time than should be given to one school activity.
74. Participation trains most individuals to make quick decisions and responses when movement is called for.
75. This type of competition often causes a disregard for the rules of the game.
76. This type of competition encourages better performance from all children because everyone wants to "make the team."
77. Participation helps to train most individuals in accepting the rules of the majority.
78. Most participants in this type of activity learn how to protect themselves from the bodily harm of falls and minor accidents.
79. Injuries in this type of competition are often exaggerated because they make good news items.

(Submitted 5-22-52)

Blackout Interval During Eye Blinks

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A NUMBER OF extremely interesting and rather startling consequences of normal involuntary blinking upon many phases of human activity have been discussed in a recent report by Lawson (3). It is the conclusion of this investigator that the blink has an important bearing upon the accuracy attainable in a variety of physical measurements, efficiency in bombing a target and fighter combat, proneness to automobile accidents, and success in various athletic activities.

These consequences of normal blinking result from the following factors: (1) during a blink the pupils are masked by the lids and a complete blackout ensues; (2) under constant visual conditions, the interval between blinks is remarkably constant. According to Lawson, blinks involve a blackout period of .3 seconds (3, *p. 154*) and in the predominant J-type eye occur at intervals of 2.8 seconds (3, *p. 155*). A determination of the blackout index from these values indicates that the average person is blacked out during approximately 11 percent of the total time of vision.[1] It is this condition of intermittent vision to which Lawson attributes many visual errors.

In a second report on blinking, Lawson has revised the blackout period downward to a range of .1–.3 seconds (4, *p. 531*). While this would reduce the probable effects of blinking, it does not necessarily render it insignificant. A blackout period even as brief as .1 seconds could have pronounced effects in many visual situations. In batting, for example, a blink during the pitch could mean losing the ball for as much as 15 feet of its flight.[2] Comparable effects could be found for many other visual situations.

Although Lawson's general analysis of the effects of normal involuntary blinking upon vision will undoubtedly be counted an important contribution to our understanding of visual errors and limitations, there appears to be some question as to the actual extent of this effect. His estimates of the blackout period have been based principally upon Duke-Elder's summary of several studies involving measurement of the duration of a *full* blink (2, *p. 647*). Since the blackout period involves only a portion of the full blink, it would seem that the present estimates are too great. This, of course, would result in some exaggeration of the effects of blinking upon various visual situations.

In view of the present uncertainty as to the duration of the blackout period, it was deemed worthwhile to obtain direct measures of this aspect of blinking. The experiment herein reported presents data relative to the duration of the blackout period in a visual situation involving visibility, that is, a visual

[1] The blackout index in percentage equals 100 times the ratio between the blackout period and the inter-blink period.

[2] This estimate is based upon the assumption that a pitched ball travels at uniform velocity and takes .4 seconds to travel from the pitcher to home base.

situation in which a subject is required "to recognize the presence of a light or object without having to recognize its shape or form" (1, *p. 76*).

Method

The method used in this investigation of normal involuntary blinking involved the following: (1) presentation of a light stimulus at the beginning of the blackout period, and (2) determination of the minimum duration of light for a subject to recognize the stimulus.

Apparatus. The apparatus consisted of the following units: (1) a trigger switch controlled by the eyelid, (2) an electronic timer, (3) a light stimulus, (4) a standard electric clock, (5) a reaction time key and buzzer, and (6) an adjustable chin rest.

The trigger switch is illustrated in Figure I. Briefly, it consisted of a small mercury trough articulated with one bow of a spectacles frame and a piece of # 38 copper wire attached to the eyelid. A screw arrangement made it possible to adjust the trough so that as the lid closed the end of the copper wire dipped into the mercury. The electrical action of this contact was to trigger the electronic timer. Special attention was given to keeping the mass moved by the lid to a minimum. Measurement of the actual length of wire moved by the lid and the sliver of adhesive tape used to attach the wire to the lid showed that the mass involved amounted to no more than .0235 grams.

The electronic timer was designed to produce a square wave pulse when triggered. Suitable controls were available for varying the pulse duration in ten

Fig. I. Eyelid trigger switch and disposition of subject

equal steps from .01–.10 seconds. To obtain maximum stability of operation, all critical voltages were supplied by batteries. A blocking unit was also incorporated into the timer so that it could not be triggered at intervals shorter than 2.0 seconds. The need for this arrangement was indicated in a preliminary investigation in which it was found that trial subjects occasionally produced a series of such rapid lid movements that neither the subject nor the investigator could meet the general requirements of the experimental situation.

In operation, the electronic timer pulse operated two ultra-high speed relays. One relay closed the light stimulus circuit, which turned on a NE 51 neon lamp. The other relay closed the Standard Electric Clock clutch circuit, which provided a check on the duration of the timer pulse. Calibration of the relays indicated that they closed within approximately .3 millisecond after energy was applied to the coils and returned to the open position within .1 millisecond after the coil voltage was removed. In view of the fact that a 1/100 second electric clock was used to check the timer pulse duration, it was felt that the relay lags could be ignored.

The reaction time key and buzzer were wired so that depression of the key would activate the buzzer. This unit was used by the subject to signal when a light was seen.

An adjustable chin rest was provided both for the subject's comfort during the course of the experiment and for keeping the head in a vertical position with the eyes looking straight ahead.

Procedures. At the start of each experimental session, the subject was taken to a darkened room and seated before a table as illustrated in Figure I. With the subject in position, the light stimulus was positioned so that it was located 5 feet in front of the chin rest and level with the subject's eyes. The reaction time key was positioned on the table so that the subject's preferred hand rested upon the key.

In order to determine the general visibility conditions of the experimental situation, the mercury trough was first adjusted so that the light would be triggered as the lid started a downward movement. With the timer set for .01 seconds, the subject was instructed to close his eyes for a count of three and to sound the buzzer if a light flash was seen. Since all subjects signaled that the light flash was seen on each of five test trials, it was concluded that the general visibility conditions were satisfactory for the purposes of this study.

Following the initial test adjustment, the mercury trough was gradually lowered until the point was reached where the light flash could not be seen when the lids were closed for a count of three. Special care was taken to have the light triggered as early as possible during the lid movement so that the light stimulus would appear at the start of the blackout period. Every effort was also made to keep the subjects ignorant of the fact that lowering of the lid triggered the light stimulus. The adjustment trials were interspersed with "false" trials in which the light did not appear upon lowering of the lid. Between trials involving voluntary lowering of the lid, the subjects were required to respond to the light stimulus, presented by the experimenter, when the eyes were open. To

further disguise the purpose of the experiment, all subjects were told that the procedures simply involved measurement of the speed with which a person could react to the appearance of a light flash when no preparatory signal was given.

Upon the completion of all adjustments, the subject was instructed to look directly ahead and sound the buzzer whenever a light flash appeared. It was explained that the flashes would not appear at regular intervals, that the intervals between flashes might be extremely long or short.

Each subject triggered the light 250 times in five series of trials. In the first series of trials, the light duration was adjusted to .10 seconds, and the duration was progressively decreased when the light had been triggered five times. In the second series of trials the light duration was progressively increased from .01 seconds to .10 seconds. This general procedure of progressively changing the light duration from one extreme to the other was followed until the light had been triggered 25 times at each of the ten light durations.

The subjects were allowed to rest for approximately two minutes after the completion of each series of trials. During this interval, the experimenter checked the adjustment of the trigger switch. In only one instance was it necessary to make a minor adjustment when it was noticed that the wire attached to the upper lid tended to glide against the side of the mercury trough in its downward movement.

In recording the data the experimenter sat in a room adjacent to the subject. The Standard Electric Clock, triggered with the light, indicated the number of blinks at each light duration and provided a check on the duration of the light stimulus. The buzzer indicated a light seen, and records were kept in terms of the number of lights seen at each stimulus interval.

Subjects. Fifteen male and ten female subjects were obtained from the student body, faculty, and clerical staff of Indiana University. Their ages ranged from 19 to 42 years, their median age being 26.

Results

Figure II summarizes some gross aspects of the experimental results. The data here presented show the percentage of subjects who saw one or more lights and who missed one or more lights at each light-duration interval. The following conclusions may be drawn:

1. No subject ever saw the .01-second light flash.
2. From 28 to 92 percent of the subjects saw light flashes with durations from .02 to .05 seconds, with approximately 50 percent seeing flashes at .03 seconds.
3. All subjects who saw light flashes with duration intervals of .02 to .05 seconds also missed seeing one or more of these flashes.
4. All subjects saw light flashes with durations from .06 to .10 seconds.
5. As the duration of the flash increased from .06 to .10 seconds, the percentages of subjects who saw all light flashes increased from 8 to 48.
6. Approximately one-half (52 percent) of the subjects missed one or more light flashes at the longest duration interval of .10 seconds.

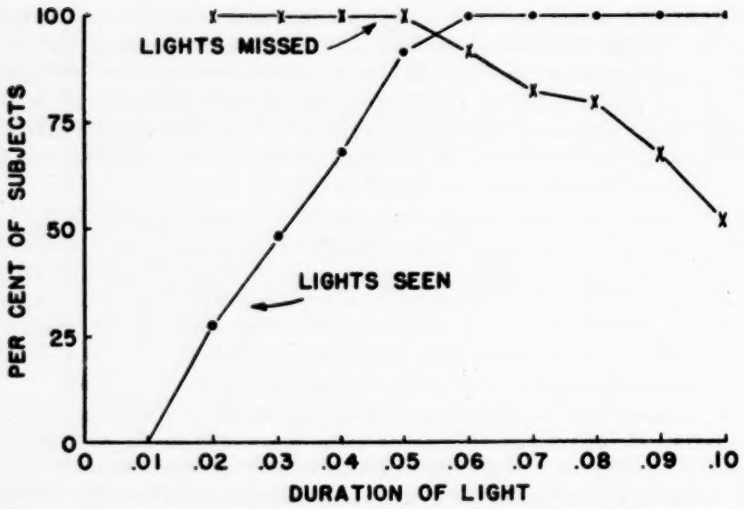

Fig. II. Per cent of subjects reporting one or more lights seen and missing one or more lights at each duration. (Twenty-five trials each per duration)

Further details of the effect of blinking upon visibility are summarized in Figure III. As shown by the upper curve in Figure III, the percentage of lights seen varied from 3 percent at a light duration of .02 seconds to 92 percent at a light duration of .10 seconds. From the results obtained, it would thus appear that the blackout effects of blinking show the same characteristics of variability as do most human responses.

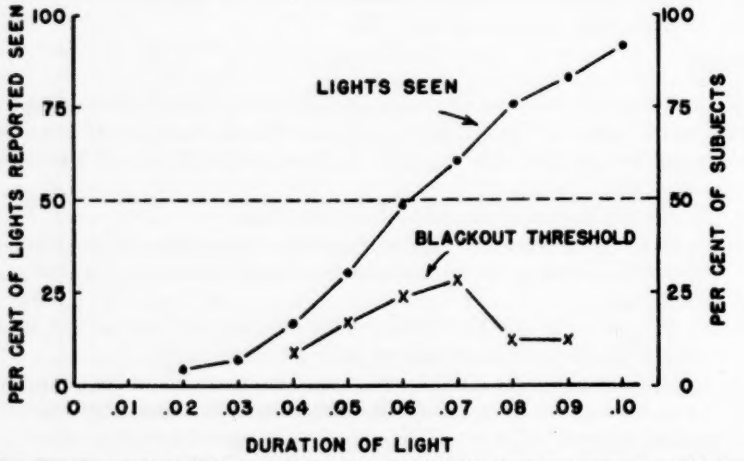

Fig. III. Per cent of lights reported seen at each light duration interval and blackout thresholds.

Since there obviously is no consistent blackout interval, that is, an interval below which all lights were missed and above which all lights were seen, it seems advisable to speak of a blackout *threshold* rather than an interval. Defining the blackout threshold as that light duration in which lights were seen approximately 50 percent of the time, it becomes evident that the threshold value for all subjects was approximately .06 seconds.

The lower curve in Figure III presents the individual threshold values, the threshold value being that light duration in which 12 out of 25 lights were reported seen.[3] As can be seen, the individual threshold values ranged from .04 to .09 seconds, the modal value being .07 seconds. On the basis of results obtained from the 25 subjects used in this investigation, it would thus appear that individuals vary markedly in their blackout thresholds.

Discussion

The experimental results of this study agree with the conclusions of Lawson to the extent that a complete visual blackout is experienced during normal involuntary blinking. However, the duration of the blackout interval in a visual situation involving visibility is considerably shorter than the values presented by Lawson, who gave the duration of the blackout as .1 to .3 seconds. The blackout threshold for all subjects in this experiment was found to be approximately .06 seconds, with individual thresholds ranging from .04 to .09 seconds.

Although these lower threshold values markedly reduce the blackout effect in blinking, they do not render it insignificant. In the case of a modern jet plane traveling 600 miles per hour, the plane would cover a distance of approximately 50 feet during a blackout of .06 seconds. In a batting situation in which the ball travels from the pitcher to home base in .4 seconds, the ball would cover a distance of approximately 9 feet during an average blink blackout. In terms of the individual threshold values for the subjects of this experiment, a blink during the pitch would mean that the ball could not be seen over a range of from 6.5 to 14 feet of its flight. When applied to numerous other visual situations, it seems reasonable to conclude that normal involuntary blinking offers a possible explanation for many visual errors.

Conclusions

Direct measures of the blackout period during a blink were obtained from 25 adult subjects. In an experimental situation involving visibility, the blackout threshold for all subjects was found to be approximately .06 seconds, with individual thresholds ranging from .04 to .09 seconds. Some implications relative to the effect of the blink blackout upon various activities were noted.

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[3] In cases where no interval could be found in which exactly 12 lights were seen, the threshold value was interpolated to the nearest light duration interval.

(Submitted 8-28-52)

Leisure-Time Activities of Langston University Faculty Members

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THE PURPOSES of this survey[1] were (1) to reveal the leisure-time activities of the Langston University faculty members and the frequency and regularity of their participation in these activities; (2) to investigate the source of their interests in these activities; (3) to ascertain the faculty's opinions concerning the effect of marital status upon their leisure-time pursuits; (4) to reveal those activities disliked; and (5) to ascertain those activities wanted and why they do not participate in them.

Procedure

During the months of October, November, and December, of 1950, 88 members of the Langston University faculty were interviewed. This group included the officers of administration, teaching staff, and some other employees. There were 48 men and 40 women in the group.

Findings

On the basis of the findings, the following is a summary of the survey:

1. Ninety-eight recreational activities were named by the 88 faculty members, of whom approximately 60 per cent engaged in practically no active pursuits.
2. The leading activities of the faculty members according to the frequency of participation were: *daily*—reading and listening to the radio; *frequently*—playing bridge, going to movies, and taking part in faculty organizations; *rarely*—card playing and ballroom dancing; and *seasonally*—fishing.
3. Seventy-nine activities were engaged in by less than 10 persons each; 33 of them, by only one person each.
4. With 61 people having reported no participation in major or minor games, the leading non-participation seasonal pursuits were spectatorship at football, basketball, and baseball games.
5. Eighteen of the 40 faculty women and nine of the 48 faculty men were Langston University graduates.
6. The home played a major part in the development of interests in all leisure-time activities. About half the participants in games credited the schools with the development of their interests.

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[1]This survey was submitted in partial fulfillment of the requirements for the degree of Master of Science in Physical Education at the University of New Mexico, 1951.

7. Approximately half of the faculty members felt that their leisure-time activities were not affected by marriage.

8. Slightly over half of the faculty members could not think of any activities they disliked.

9. Seventy-four people wanted a total of 78 activities. The most frequent reason offered for non-participation in the activities wanted was the lack of facilities at Langston University.

Recommendations

The following recommendations were offered:

1. A faculty recreation-planning committee should be formed. This committee should take into consideration certain factors, such as: age levels of the faculty members; faculty integration; expansion of the recreation program through other faculty social organizations and university departments; and planning for many activities which the faculty members want but do not participate in, and creating interest in additional worthwhile activities.

2. University departments should be responsible for some phases of the recreation program. Examples of possible contributions suitable for this situation are: Art and Home Economics Departments—arts and crafts, interior decorating, exhibits; Industrial Arts Department—photography club, upholstering classes, woodworking; and Physical Education Department—play nights, dancing, games and sports, first aid, hiking.

3. The university should provide sufficient staff and facilities to make it possible for the various departments to contribute to the recreation program. Facilities should be made available to the faculty members without charge and a specific time arranged for their use.

(Submitted 11-11-52)

Research Abstracts

Prepared by the Research Abstracts Committee of the National Council of the Research Section, PAUL A. HUNSICKER, Chairman

Anatomy and Physiology

43. ASMUSSEN, E. and M. NIELSEN. The cardiac output in rest and work determined simultaneously by the acetylene and the dye injection methods. *Acta Physiologica Scandinavica*, **27**:217-30 (1952).

A comparison of the dye injection method, using T-1824 (Evans blue), and the acetylene method for determining cardiac output was made. Twenty-five normal male students between 19 and 26 years of age served as subjects. The work experiments were carried out on a Krogh bicycle ergometer in which the saddle had been exchanged for an armchair with adjustable armsupporters. Work intensities ranged up to 1,260 mkg. per minute (oxygen consumption up to about 3 liters per minute).

The arterio-venous oxygen differences obtained by the two methods were plotted against one another and it was found that the points were distributed symmetrically around the line of identity. The standard deviation from this line was ± 13.4 cc. per liter.

In the work experiments, the arterio-venous oxygen differences increased with increasing rate of work up to a value of about 145 cc. per liter. The two methods gave almost identical values and the standard deviations were almost the same.—*Paul Hunsicker.*

44. BALES, SPENCER. Psychiatric contributions to the treatment of obesity. *Amer. Jour. of Med. Sci.*, **219**:104-187 (1950).

A psychological perspective not commonly taken into account by educators and others interested in school and public health is presented. The basic problem of the obese individual whose condition is not due to metabolic disorder (and relatively few are) is not fatness itself but the psychological state that brings about the need for excessive eating. Obesity is typically symptomatic. More food is ingested than is necessary because these individuals have few other forms of social acceptance and find eating a relief from tension. Moreover, food tends to symbolize to them the affection that they seek.

Youngsters with a psychological component of this kind involved in their eating habits are not likely to respond to a frontal attack upon the obvious problem. Pressure for weight reduction that does not take into account the general psychological picture might reasonably be expected to have injurious rather than constructive effects.—*Warren R. Johnson.*

45. DEFOREST, R. E., J. F. HERRICK, J. M. JANES, and F. H. KRUSEN. Effect of ultrasound on growing bone. *Arch. Physical Med.*, **34**:21 (1953).

Dogs and rabbits were used. The upper tibial epiphyseal region of the left hind leg was exposed to a frequency of 800,000 cycles per second. Changes in bones were studied by means of periodic roentgenograms, the right hind leg serving as a control. It was found that ultrasonic energy does not cause acceleration of the longitudinal growth of the bone. On the contrary, it produced shortening of the tibia and femur with a simultaneous irreparable damage to the knee joint, femoral epiphyseal cartilage, and the bone shaft.—*Peter V. Karpovich.*

46. ELKINS, E. C., J. F. HERRICK, J. H. GRINDLAY, F. C. MANN, and R. E. DEFOREST. Effect of various procedures on the flow of lymph. *Arch. Physical Med.*, **34**:31 (1953).

Dogs and rats were used. Each animal had thoracic lymph duct cannulated so that lymph could be collected and the amount of flow could be measured. No significant

changes of lymph flow were observed during application of heat: infra-red, short-wave and micro-wave diathermy. A marked increase was observed during exercise, kneading, and stroke massage. Passive exercise also increased lymph flow. (Rats were used only for micro-wave experiment.)—*Peter V. Karpovich.*

47. Hewitt, David and Alice Stewart. The Oxford child health survey: a study of the influence of social and genetic factors on infant weight. *Human Biology*, **24**:4:309-323 (Dec. 1952).

Investigation was based upon 298 and 282 boys' and girls' first-year life records, respectively. The study suggests that standards of normal weight in infancy should be adjusted for parity and parental size as well as sex of the infant. When this was done on the above sample, there was a considerable reduction in estimated differences defined by maternal efficiency, home amenities, social class, and sickness experience. On the other hand, bad antenatal health still had measurable effect on birth weight, and breast-fed babies were still found by adjusted standards to remain lighter than bottle-fed babies at one year of age.—*D. B. Van Dalen.*

48. Ladd, M. P., F. J. Kottke, and R. S. Blanchard. Studies of the effect of massage on the flow of lymph from the foreleg of the dog. *Arch Physical Med.*, **33**:604 (1952).

Dogs were used. A lymph channel above the shoulder was cannulated so that lymph could be collected and measured. Massage was found to be more effective in increasing the lymph flow than either passive movements or electric stimulation. (During electric stimulation, both the flexor and the extensor muscles of the foreleg were in a state of static contraction.)—*Peter V. Karpovich.*

49. Lasker, Gabriel W. Environmental growth factors and selective migration. *Human Biology*, **24**:4:262-289 (Dec. 1952).

Comparative measurements of 185 male and 23 female adult Mexicans, who had been in the United States, with 111 male and 158 female non-migrants were taken in Paracho, Michoacan. The study revealed that migrants of both sexes are larger in various dimensions than sedentes. The younger male migrants were larger in most respects than those who migrated at a later age. With several exceptions, there is little difference in any dimension, which can be ascribed to age differences, between males who never left Mexico and the male migrant who first went to United States after age of 27. The study lends no support to the hypothesis of an appreciable physical selection of the migrants but confirms the existence of environmental growth factors—largely dietary—on Mexican emigrants to the United States.—*D. B. Van Dalen.*

50. Lery, Robert L., Granville F. Knight, M. C. Myerson, and Frank L. Rosen. Medical forum on effects of tobacco smoking. *Mod. Med.*, Jan. 1, 1953, pp. 120-124.

Immediate effect on the circulation is due to nicotine, and variability in response depends to a greater extent on individual susceptibility than the presence of cardiac disease. Smoking cigarets rarely induces anginal pain in patients subject to spontaneous attacks. Because of enjoyment and emotional satisfaction, patients with inactive forms of heart disease may smoke in moderation—not more than ten cigarets a day. The same circulatory reactions occur by smoking so-called de-nicotinized brands as for ordinary varieties. Smoking should be forbidden in patients with congestive heart failure, acute stages of cardiac infarction, and active rheumatic carditis.—*R. L. Lery, M.D.*

How is practical and effective advice to be given in regard to smoking? Obviously unpleasant or harmful results from smoking must be demonstrated. This is not difficult since clinical hypersensitivity exists, and discovery of this state affords a basis for judgment. The cardio-vascular response to a smoking test coupled with a 24-hour pulse chart affords a basis for the determination of tobacco allergy or hypersensitivity. Rises in pulse rate and blood pressure were used to determine positive reactors. Negative

reactors showed no change or a slight drop in pulse and blood pressure readings. The following symptoms were relieved in one or more positive reactors when smoking was stopped or markedly reduced: severe fatigue, palpitation, tachycardia, extrasystoles, hypertension, headache, tension, forgetfulness, fearfulness, mental confusion, depression, post-nasal drip, nasal and sinus congestion, facial pains, pharyngitis, morning cough, hoarseness, chronic bronchitis, paroxysmal tachycardia, spasm and aching of interscapular muscles, constipation, and others. Smokers with any of these complaints are entitled to a smoking test. Relief may be expected within 48 hours if the symptoms are due to smoking and a recurrence of discomfort will accompany resumption. Positive smokers relieved by temporary avoidance of tobacco should be advised to quit for good. Moderation usually fails.—*G. F. Knight, M.D.*

From the standpoint of the otolaryngologist, smoking should be prohibited in the presence of acute and subacute conditions of the respiratory tract including sinuses, nasopharynx, pharynx, larynx, the tracheobronchial tree. It should be avoided in asthma and active pulmonary tuberculosis. Post-nasal drip could be eliminated in many persons if they quit smoking. Cough is a constant symptom and localized edema of the vocal cord may occur.—*M. C. Myerson, M.D.*

Some patients get an attack of rhinitis or asthma from one cigaret. Others get migraine, leg pains, gastrointestinal symptoms, angina, cough, or sore throat. Smoking should be prohibited for anyone who gets symptoms from smoking, whether respiratory, vascular, or gastrointestinal.—*Frank L. Rosen, M.D.*

Abstracted by Frank D. Sills.

51. Meredith, Howard V. North American Negro infants: size at birth and growth during the first post-natal year. *Human Biology*, **24**:4:290-308 (Dec. 1952).

Comparisons between North American Negroes and whites for the first post-natal year were made by colligating all relevant sources on eight anthropometrical measures. It was found that the mean weight of viable Negro infants at birth and Negro infants receiving adequate dietary and medical care from birth are 4 and 2 per cent lighter than average whites, respectively. The average stature at birth is 2 per cent shorter for Negroes than whites, but under favorable diet and medical care no differences between the groups existed after six months. Compared with white children throughout the first post-natal year, Negro infants are smaller in head width, stem length, trunk length, and hip width.—*D. B. Van Dalen.*

52. Russels, Allen S., M.D. Management of scapulocostal syndromes. *Mod. Med.*, Dec. 1, 1952, pp. 124-125.

Half the cases of shoulder pain result from poor posture displacing the scapula or the ribs, and the symptoms may involve the neck, arm, or chest wall. There are three forms of the scapulocostal syndrome: primary, due to habitual slouch or nervous tension; secondary, following acute immobilization lesions; and static, seen in amputees, hemiplegics, and other disabled persons.

In the primary syndrome (ages 35-60) pain is first felt at the top or back of the shoulder girdle and may radiate into the neck and occiput, chest wall, upper arm, and down the forearm to the fingers. Symptoms may persist for years.

The secondary type of syndrome is found in younger people and develops faster. Subdeltoid bursitis, shoulder dislocation, fracture and arthritis may be responsible, especially with prolonged bed rest. The third type of syndrome (static) is common with fixed deformities.

Trigger points are usually found under upper angle of shoulder blade or root of scapular spine. Pressure on sensitive areas reproduces typical pain, and one or more injections of a local anesthetic gives relief. Posture is corrected by exercise, improved postural habits, and support.—*Frank D. Sills.*

Education

53. JOHNSON, GEORGE H. General backgrounds and activities of teachers. *School and Society*, **77**:1993: 129-132 (Feb. 28, 1953).

Information on home, professional, and recreation status was collected in 1949 from 1,086 public school teachers from ten urban communities in New York State. Sample included 844 women (477 single) and 242 men, representing 39.1 per cent of all teachers. In general, teachers come from skilled labor backgrounds and reared in small and medium-sized communities. Size of family was small and no dependents other than spouse or children. The majority possessed four or more years of college training. Stability in employment was reflected in frequency of job turnover, length of tenure, experience in educational work, and future plans. Many male teachers reported supplemental employment. Numerous recreation interests were reported, many of which were a sedentary nature, particularly among females.—*D. B. Van Dalen.*

54. LIEN, JUEL ARNOLD. A comparative-predictive study of students in the four-year curricula of a teacher education institution. *J. of Experimental Educ.* 21:2:1-219 (Dec. 1952).

Comparative and predictive data were obtained on 50 students of Freshman and Sophomore classification, from each of the rural, elementary, academic, and commercial curricula. This investigation supports the generalization that differences in abilities, interests, and personal qualities exist between students in the several curricula. Some characteristics appear to be related to success in one curriculum, whereas other qualities are more closely related to success in other curricula. Where the same characteristic was associated with success in more than one curriculum, it was not uncommon to find various degrees of a trait required from one curriculum to another.—*D. B. Van Dalen.*

55. LOBAN, WALTER. A study of social sensitivity (sympathy) among adolescents. *J. of Educ. Psychology*, **44**:2 (Feb. 1953).

Two unlike groups of 230 boys and 200 girls were studied with reference to attitudes, needs, behavior, or idiosyncrases in an attempt to explain their differences in social sensitivity. On most of the measures, girls varied more than boys. No significant differences between the more and less sensitive groups were found in intelligence, church attendance and denomination, reading ability, size of family, or position of child in order of birth. The most sensitive children were popular with their peers. They exhibited greater interest in books with idealistic, aesthetic, or sympathetic themes and were more concerned over relationships with people. They worried more and longer over behavior and were aware of their limitations, inadequacies, and failures in human relationships.—*D. B. Van Dalen.*

56. MORRIS, VAN CLEVE. Football and the university. *Amer. Assoc. of Univ. Prof. Bull.*, **38**:460-68 (Autumn 1952).

The thesis of the article is that big-time, intercollegiate athletics as now carried on and higher education as we have known it are fundamentally and basically incompatible. The writer believes that athletics in an educational institution must be justified on educational grounds. The suggestion is made that athletic departments be given greater autonomy with the idea that they be ultimately separated from the rest of the university.—*Paul Hunsicker.*

Recreation

57. A study of public golf course operation. *Recreation*, **46**:2:115-116 (May 1952).

A questionnaire was submitted to authorities operating public golf courses in 1951, requesting information as to receipts, operating costs, fees, and other items relating to the operation of the courses. The findings of the survey were based on an analysis of the 56 returns received.

Some findings of the study were as follows: (1) Of the 56 cities reporting, 33 operated their golf courses on a self-supporting basis. In some cases the profits from concessions and refectories were included in the course income. (2) The cost of operation per player varied from 31 cents to $1.81, the average being around 65 cents. (3) Season ticket policy and charges varied quite a bit, with several attractive reductions for women and juniors. The cost of daily tickets for 9 or 18 holes also varied. The average greens fee for 18 holes was $1.00 and for 9 holes, 60 cents. (4) Where concessions or refectories were in operation, 31 were let out on contract; 16 were operated by the city itself; eight were run by the pro, usually as a part of his compensation; one by a caretaker; and one by a steward. Seventeen served complete meals; twenty served beer, and only three served liquor. (5) Of the 56 cities, 21 kept their courses open during the winter, although a few made no charge during this period.—*Jackson M. Anderson.*

58. Surfacing under fixed apparatus. *Recreation*, **46**:3:164-165 (June 1952).

A questionnaire was sent to recreation and park authorities. It included several questions relating to surfacing under fixed apparatus.

Some findings of the study were as follows: (1) a large majority (166) of the executives reporting had apparatus concentrated in one section of their playgrounds; (2) one-third (64) of those reporting had set off the apparatus section from the rest of the playground by a fence, hedge, or curb; (3) two-thirds of the executives reported the same surfacing under the apparatus as on other sections of the playground; (4) the seesaw was more often reported on dirt, loam, or clay than was any other type of apparatus; the high slide on sand; chair swings on turf; standard swings on asphalt, sand seesaw on a sand surface, or the giant stride or slides on asphalt; (6) standard mixtures, or stone surfaces; (5) relatively few cities reported the merry-go-round and swings more than any other piece of apparatus were consistently reported on all types of surfaces; (7) natural surfaces—dirt, loam, clay—with no special type of surfacing were reported most frequently; (8) sand, or sand in combination with other materials such as loam, shavings, gravel, sawdust, or tanbark, was the special type of surface most frequently reported; and (9) turf or grass ranked third and was reported more frequently under chair swings, slides, and climbing structure than under other types of apparatus. —*Jackson M. Anderson.*

59. Seventy effective promotion techniques. *Camping Magazine*, **24**:9:12 (Dec. 1952).

A questionnaire was circulated among a cross-section of camp directors. Among other questions, the directors were asked to list, as nearly in order as possible, the most successful techniques they had used in promotion and public relations.

The findings of the study indicated the following as the most effective promotion techniques used with campers: (1) personal visits; (2) camp reunions; (3) personal letters; (4) camp movies; (5) camp newspaper; (6) birthday and special cards; and (7) making prospects feel at home. Those techniques used most effectively with parents were as follows: (1) personal visits; (2) direct mail; (3) camp movies; (4) camp folder and/or catalogues; (5) camp newspaper; and (6) phone calls from director. The most effective techniques used with alumni were as follows: (1) camp newspaper; (2) personal contacts and correspondence; (3) invitations to reunions; (4) invitations to camp during summer; and (5) gifts to new babies.

The following techniques were used most effectively with the home community: (1) be active in social and civic groups; (2) work on community projects; and (3) use newspaper, radio, and TV. The following were the most effective techniques used with the camp community: (1) co-operate in community projects; (2) educate campers and counselors to their responsibility to the local community; and (3) invite members of community into camp for special occasions. Those techniques used most effectively with other camp directors were as follows: (1) be sincerely friendly; (2) show desire and willingness to share experiences; and (3) attend ACA and section meetings.—*Jackson M. Anderson.*

Guide to Authors

IN LINE WITH the over-all goal of making Association publications yield the greatest value to the individual and the profession, the following is a guide for the preparation of research manuscripts. The information below recognizes general techniques being employed by research publications similar to the *Research Quarterly*. When copy is prepared in accordance with these instructions, all Association research studies will follow a standard style.

Manuscripts

Manuscripts should be sent to the Editor (AAHPER, 1201 Sixteenth Street, Northwest, Washington 6, D. C.), who will see that each one is read by at least three members of the *Research Quarterly* Board of Associate Editors. On the basis of the three reviews, the Editor will advise the author as to the suitability of the paper or the desirability for revision. Papers are not judged by arbitrary standards but on their content of new research results in the field of physical education, health education, and recreation, presented with the greatest brevity compatible with scientific accuracy and clarity.

Since three members of the Board of Associate Editors review an article, it is requested that three clear copies of the manuscript be submitted in order to facilitate reviewing. A fourth copy of the article should be retained by the author. Only one copy of any charts, photographs, drawings, graphs, or similar illustrative material need be submitted. However, since such material must be sent to each reviewer in turn, more time must be allowed for the reviews.

Typewritten manuscript should be double-spaced on white paper of ordinary weight and standard size (8½ x 11 inches).

The sheets of manuscript should be kept flat and fastened with clips which can be removed easily. The pages of the typewritten copy should be numbered consecutively in the upper right-hand corner.

Paragraphs should be numbered consecutively throughout the manuscript to facilitate ease of reference in case of revision.

Headings

The article should be arranged so as to indicate relative values of heading and subheadings.

Usually four gradations are sufficient: (a) article title, (b) first subhead appearing in boldface aligned left on page (underscored in manuscript with wavy line) (c) second subhead (if necessary) appearing in small caps aligned left on page, (d) third subhead, to appear in italic (underscored in manuscript), not centered, but run in at the beginning of the paragraph or section.

All headings should be typed in lower case with initial capitals, except for (c) above, which should be typed in capital letters.

Documentation

FOOTNOTES

Footnotes are not to be used for references or literature citations. They are rather used for the purpose of acknowledgment, special explanation, supplementary information, etc. (*See examples below.*)

Type footnotes (if any) on separate sheets, as many footnotes as convenient being written on a sheet. Footnotes should be numbered from 1 up for each article; a corresponding numeral appearing in the text. Asterisks should not be used.

Examples of Footnotes:

[1] This study was made under the direction of Dr. Arthur T. Slater-Hammel in the Research Laboratories, School of Health, Physical Education, and Recreation, Indiana University, Bloomington, Indiana.

[2] All measurements of the hand were recorded in centimeters and height was recorded in inches. The hand measurements were taken by Everett and reliability coefficients of above .90 were found for each measurement used in the study.

[3] For their wholehearted co-operation in facilitating collection of the data, special gratitude is extended to Superintendent Clarence Hines and the 1950-51 principals of the Adams, Condon, Edison, Francis Willare, Harris, Howard, Lincoln, River Road, and Whiteaker schools.

CITATIONS OF LITERATURE

Citations of literature should be segregated alphabetically by author's last name at the end of each article, under the caption of "REFERENCES." *Do not treat them as footnotes.* (*See above.*)

The literature citations, listed alphabetically, should be numbered consecutively, their location in the text being indicated by corresponding numbers written in full size and enclosed in parentheses: for example, (1) (2, 3). If there are several references in the text to a citation, the specific pages may be indicated thus: (1, *p. 117*) (1, *pp. 162-3*).

A uniform style should be maintained in writing citations. Do not enclose titles of chapters and articles in quotation marks. Italicize (underscore in manuscript) names of books and periodicals, bulletins, etc. (*See examples below.*)

Uniform sequence of data should be observed, as follows: *For a book*—Author's name (last name first); title of article or chapter; name of book; place of publication; publisher; year date; number of pages or specific pages referred to. *For a periodical*—Author's name (last name first); title of article or chapter; name of periodical; volume number; page numbers; year date; specific pages (if any).

Examples of References Appearing at End of Article:

1. American Association for Health, Physical Education, and Recreation. Suggested platforms for health education. *Journal of the American Association for Health-Physical Education-Recreation* **18**:436 (Sept. 1947).
2. American Association of School Administrators. *Health in Schools.* Revised edition. Washington, D. C.: the Association, a department of the National Education Association. pp. 266-7.

3. DEAVER, G. G. Exercise and heart disease. *Research Quarterly* **26**:24-34, 1939. p. 26.
4. OGDEN, JEAN, AND JESS OGDEN. *Small Communities in Action.* New York: Harper & Brothers, 1946, 244 pp.
5. POTTER, JOHN NICHOLAS. *Physical Fitness of Junior High School Boys.* Unpublished Master's thesis, University of California, Berkeley, 1942, 39 pp., p. 15.

Tables

Each table should have a descriptive heading and should be specifically referred to in the text by number, *e. g.*, "Table 10," etc., never as "the above table" or "the following table." Number tables from 1 up for the entire manuscript, using Arabic numerals.

Tables should be double-spaced typewritten, like the rest of the material in the manscript. They should be typed on separate sheets, as the printer will set them on a different machine from the one used for the text matter. If a table continues on a second sheet, it is not necessary to repeat the boxheads, since the printer will repeat from the original boxheads, when necessary.

The word "TABLE" should be written in capital letters, as: "TABLE 1"; the table title should be written in lower case letters with initial capitals, and centered over the table. Tables should be ruled as desired, except that no rules will appear at the extreme right and left edges of the table. No double rules are to be used, unless necessary for clarity.

Illustrations

Illustrative material is of two types: pen and ink drawings, which are reproduced by the line engraving process; and photographs, wash drawings, stipple drawings (in short, anything containing shading), which are reproduced by the halftone process.

Line engravings are always treated as text figures and should be so designated. All drawings should be made with India ink, preferably on white tracing paper. If graph paper is used, a blue-lined paper must be chosen, as all other colors will make the graph lines appear in the background; sometimes it is desirable to ink in inch squares so that the curves can be more easily read.

Lettering should be plain and large enough to reproduce well when the drawing is reduced to the dimensions of the printed page (4⅛ x 7 inches). Most figures can be advantageously drawn for a linear reduction of one-half or one-fourth. Explanatory lettering should be included within the chart. Do not use gummed letters, for they are easily lost.

Care should be taken not to waste space, as this means greater reduction and a less satisfactory illustration. Often it is possible to combine several curves in one figure and thus not only save space but enable the reader to make comparisons at a glance. Legends can often be included within the chart and a considerable saving in space thus effected.

Halftones are treated as figures and should be so designated. Frequently, several halftones can be grouped to form an attractive full page, in which case they should be numbered consecutively, in Roman numerals. Photographs should be in the form of clear black-and-white prints on glossy paper. Care

should be taken to see that they cannot be bent or folded in handling *and paper clips should not be used.* All imperfections in the original copy are reproduced.

Figures should each be numbered consecutively from I up for the entire manuscript. Use Roman numerals to number figures, and Arabic numerals to number tables. The legends for the illustrations should be typed upon a separate sheet placed at the end of the manuscript. Care should be taken to indicate plainly in the text the exact location of all illustrations and tables.

The Association will assume complete engraving expense.

Special Points of Style

USE OF NUMBERS

Use Arabic figures for all definite weights, measurements, percentages, and degrees of temperature (for example: 2 kgm., 1 inch, 20.5 cc., 300°C.). Spell out all indefinite and approximate periods of time (for example: over one hundred years ago, about two-and-one-half hours). For numerals used in a general sense, spell out numbers through ten and use Arabic figures for 11 and over (seven times, five years old, 11 students).

ABBREVIATIONS

The metric system being in universal usage, standard abbreviations should be used whenever the weights and measurements are used with figures, i.e., 10 kgm., 6.25 cc., etc. The forms to be used are: cc., kgm., mgm., mm., l., and m. *Gram* should be spelled out in all cases to avoid possible confusion with *grain.* All obscure and ambiguous abbreviations should be avoided. Spell out English weights and measures (for example: ounce, pound, inch, foot, yard, mile). Preserve uniformity in all abbreviations.

Per cent should be two words. Use per cent sign (%) in tables or when it appears in parentheses in text.

Proofreading

The author will receive his original manuscript and any engraver's proofs with the galley proofs of his article for correction. A reprint order blank will be enclosed for the author's convenience.

Authors should be sure to answer all queries addressed to them on the proof. Any instructions to the printer should appear on the proof itself. If instructions are too extensive to write on proof, they may be embodied in a letter. Instructions and answers to queries should be circled to avoid the possibility of mistaking them for new copy.

Corrected proofs and original manuscripts are to be returned within 48 hours by first-class mail to the Editor, AAHPER, 1201 Sixteenth Street, Northwest, Washington 6, D. C.

OTHER AAHPER PUBLICATIONS

1. * ***Administrative Problems in Health Education, Physical Education, and Recreation.*** 1953. 136 pp. Paper **$2.00**; Cloth **$2.50**

2. ** ***School Health Services.*** Prepared by Joint Committee on Health Problems in Education of the NEA and AMA. 1953. 480 pp. **$5.00**

3. ***Convention proceedings of the College of Physical Education Association***—1938, '39, '40, '41, '48, '49, '51, '52, each **$1.75**; 1953, **$2.00**

4. ***American Academy of Physical Education—Professional Contributions.*** Papers and reports presented at the annual meetings— ***No. 1***—1950—51. 94 pp. **$1.50**; ***No. 2***—1952. 88 pp. **$1.50**

5. ***Physical Education—An Interpretation.*** Third version of the Platform for Physical Education. 2-9 copies, 35c each; 10-99 copies, 25c each; 100 or more, 10c each. Single copy, **50c**

6. ***Desirable Athletic Competition for Children.*** Joint Committee Report: AAHPER, Society of State Directors of Health, Physical Education, and Recreation, and Elementary School Principals (NEA). A guide for those concerned with athletics for children. 2-9 copies, 35c each; 10-99 copies, 25c each; 100 or more, 20c each. Single copy, **50c**

7. ***Recreation Bibliography.*** An up-to-date list of books, with authors, publishers, dates of publication, pages, and prices. 1952. 71 pp. **$1.00**

8. ***Annotated Recreation Bibliographies,*** 1939-51, prepared by Eleanor L. Wright

Canoeing	**25c**	***Sailing***	**35c**
Paddle Board	**10c**	***Boating***	**25c**

9. ***Evaluation Schedules for Major Programs in Health Education, Physical Education, and Recreation,*** prepared as part of the American Association of Colleges for Teachers Education accreditation plan. 1952. A set of schedules (all 3 areas) **$1.00**; Separate schedule (one area) **50c**

10. ** ***Putting PR into HPER.*** Public Relations Handbook designed especially for health educators, physical educators, and recreation personnel. Published jointly by AAHPER and the National School Public Relations Association. 1953. 68 pp. **$1.00**

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